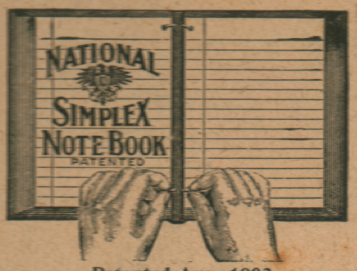
H. L. Branson,
Keyser,
W. Va.

# National "Simplex" Note Book

*Number 3810*

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# DEFINITIONS

| | |
|---|---|
| PHYSICS | is that science of matter and energy which treats of the laws that express the relation between physical phenomena and their causes. |
| MATTER | is anything which occupies space and can be perceived by one or more of the senses. |
| FORCE | is any action which tends to produce change or destroy the motion of a body. |
| EXPERIMENT | is a question put to nature and the obtained result is her answer |
| METER | is the distance between the ends of a platinum rod kept in the Archives of Paris at a temperature of melting ice. |
| YARD | is the distance between the centers of two transversal lines in two gold plugs in the bronze bar kept in the office of the Exchequer in London at 62° |
| WEIGHT OF A BODY | is the measure of the mutual attraction of the body and the earth. |
| MECHANICS | treats of the action of forces upon bodies. |

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# DEFINITIONS

**MOTION** A body is said to have motion when it is continually passing from one potion to another.

**UNIFORM MOTION** is when a body moves over equal space in equal time.

**SPEED** is the rate in change of distance.

**ACCELERATION** is the rate of change of speed.

**VELOCITY** is the speed in a definite direction.

**FREELY MOVING BODY** is a body moving under the influence of gravity alone.

**MOMENTUM** of a body is the product of the mass of a body by its velocity.

## NEUTON'S LAWS OF MOTION

**NO 1** Every body tends to persevere in its state or rest or uniform motion in a straight line unless it is acted upon by impressed force.

**NO 2** Change of momentum is proportional to the impressed force and takes place in the direction of the straight line in which the force acts

**NO 3** To every action there is an equal

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# DEFINITIONS

and contrary reaction.

**DYNE** is a force that acting upon one gram of mass will give to it an acceleration of one centimeter per second per second.

**POUNDAL** is a force that acting upon one pound of mass will give it an acceleration of one foot per second per second.

## RESULTANT

**CASE 1** The resultant of two forces acting in the same straight line in the same direction is the sum of the given forces

**CASE 2** The resultant of two forces acting in the same straight line but in opposite directions is the difference of the given forces and acts in the direction of the greater force.

**CASE 3** The resultant of two forces acting at an angle to each other may be found by completing the parallelogram upon the forces as sides and

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# DEFINITONS

| | |
|---|---|
| | drawing the diagonal from the common point of application. |
| EQUILIBRANT | any number of forces has a force equal in magnitude and opposite in direction to their resultant. |
| PARALLAL FORCES | are two or more forces acting upon a body in parallel directions but at different points of application |
| ANGLE OF REFLECTION | is equal to the angle of incidence. |
| CENTER OF GRAVITY | is the point of application of the parallel forces acting upon a body. |
| POWER | The work done in the given time divided by the time gives the average rate of work or power. |
| 1 HP | equals 550 ft. pounds per second. |
| 1 HP | equals 745.97 watts |
| POTENTIAL ENERGY | is the energy a body has on account of its position |
| VIBRATING BODY | is one that repeates its motion at regular intervals of time. |
| COMPLETE VIBRATING | is the motion between two successive |

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# DEFINITIONS

passages of the moving body through any point in its path in the same direction.

**TRANSVERSED WAVE** is one in which the vibration of the particles is at right angles to the direction in which the waves travel.

**SOUND** is that form of vibratory motion in an elastic medium, which is capable of effecting the auditory nerve and producing the sensation of hearing.

**WORK** is the act of effecting a change in the state of a system against a resistance which opposes that change

**EAR WO** is approximately ~~10,000,000~~ gram centimeters per second.

**SOUNDING BODY** is in vibration.

**NO. OF VIBRATIONS** is called frequency.

**PERIOD** is the reciprocal of the frequency.

HAMMERMILL BOND

# DEFINITIONS

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**UTILITY OF THE BROMITER**

I A rising barometer indicates the approach of fair weather.

II A sudden fall precedes a storm.

III An unchanging high barometer indicates settled fair weather.

**BOYLE'S LAW** The temperature remaining constant the volume of a gas varies inversely as the pressure sustained by it.

**CHAS. LAW** The pressure remaining constant the volume of a mass of gas varies directly as the absolute temperature.

**CUPVILINEAR MOTION** Curvilinear motion is the motion along a curved line.

**PERIODIC MOTION** The motion of a body is said to be periodic when it goes through the same series of movements in successive equal periods of time.

**CENTER OF PERCUSSION** is equal to the center of oscillation.

**LAW OF UNIVERSAL GRAVITYTION** Every portion of matter in the universe attracts every other portion, and the stress between

# DEFINITIONS

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them is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

**STABILITY** It is the state of being firm.

**LAWS OF FALLING BODIES**

I The velocity attained by a falling body is proportional to the time of falling.

II The distance fallen is proportional to the square of the time of descent

III The acceleration is twice the distance a body falls in the first second.

**PROJECTION UPWARD** The body will return to the starting point with a velocity equal to the velocity of projection but in the opposite direction.

**CENTRIPETAL FORCE** is a force pulling toward the center in a revolving body.

**CENTRIFUGAL FORCE** is a force pulling faraway from the center.

MERMA

# DEFINITIONS

**LAWS OF THE PENDULUM**

I For small amplitudes the period of vibration is independent of the amplitude.

II The period of vibration is proportional to the square root of the length.

III The period of vibration is inversely proportional to the square root of the acceleration of gravity.

**MACHINE** is a device designed to change the direction or magnitude of a force required to do useful work.

**LAW OF MACHINES** The work by the applied force equals the work done in overcoming the resistance.

**FRICTION** Friction is the resistance which opposes an effort to slide or roll one body over another.

**EFFICIENCY OF MACHINES** The efficency of a machine is the ratio of the useful work done by it to the total work done by the acting force

# DEFINITIONS

**MOMENT OF A FORCE** The moment of a force is the product of the force and the perpindicular distance between its line of action and the axis of rotation.

**LEVER** The lever is a rigid bar turning about a fixed axis called the fulcrum.

**PULLEY** The pulley consists of a wheel, called a sheave, fred to turn about an axle in a frame called a block.

## MECHANICAL ADVANTAGES

**OF THE LEVER** The mechanical advantage of the lever equals the inverse ratio of its arms

**OF THE MACHINE** The mechanical advantage of a machine is the ratio of the resisting force to the applied force.

**OF THE WHEEL AND AXLE** is the ratio of the radius of the wheel to that of the axle.

**OF THE PULLEY** When a continuous cord is used the mechanical advantage of the pulley is equal to the

# DEFINITIONS

HAMMERMILL BOND

number of times the cord passes to and from the movable block.

OF THE INCLINE PLANE

I The mechanical advantage when the effort is applied parallel to the face of the plane is the ratio of the length of the plane to its height.

II The mechanical advantage when the effort is applied parallel to the base of the plane, is the ratio of the base of the plane to its height.

OF THE SCREW

equals the ratio of the distance traversed by the effort in one revolution of the screw to the pitch of the screw

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# EXPERIMENT NO.1.
## LABORATORY

**OBJECT** To prove that gas will pass through the pores of the wall of a battery cup.

**APPARATUS** A battery cup, glass beaker, funnel, flask, rubber cork, and jet tube.

**REAGENTS** Illuminating gas and water.

**PROCEEDURE** I made all joints air tight in my apparatus and forced a stream of illuminating gas into the glass beaker.

**OBSERVATION** I observed that the gas passed through the porous walls of the cup and caused a pressure in the flask forcing water out the jet tube.

**CONCLUSION** I concluded that by effusion gas will pass through the pores of a solid and cause the liquid to pass through the jet tube.

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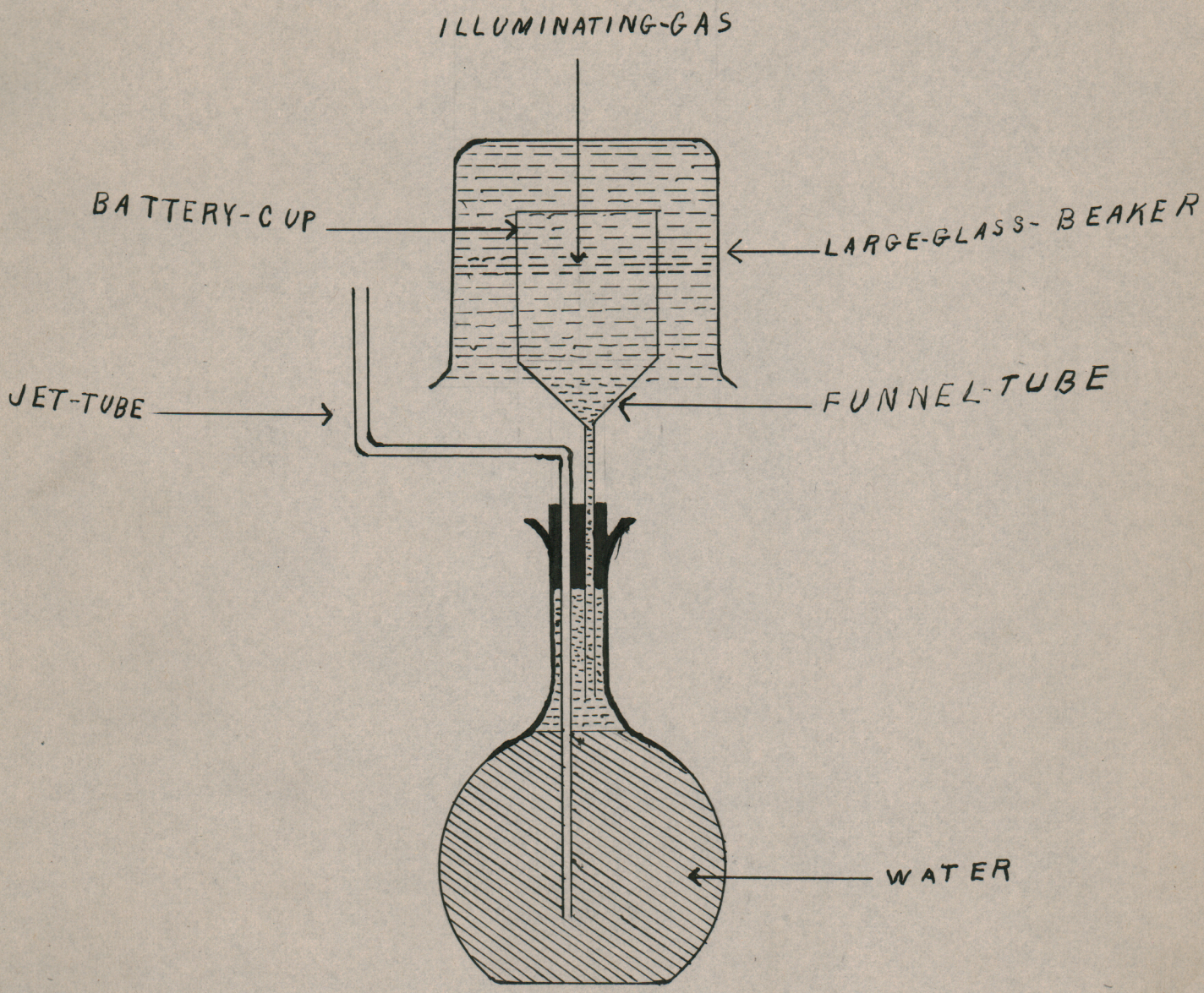


# EXPERIMENT
# NO I
# PHYSICS

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# EXPERIMENT NO. 2.
## LABORATORY

| | |
|---|---|
| OBJECT | To illustrate capillary action |
| APPARATIS | Six glass tubes supported vertically in a vessel. |
| REAGENTS | Water |
| PROCEDURE | I placed water in vessel containing the glass tubes as illustrated. |
| OBSERVATION | I observed that the water will rise the highest in the tube with the smallest diameter and the least in the one of largest. |
| CONCLUSION | I concluded that liquids will rise higher in tubes of the smallest diameters. |

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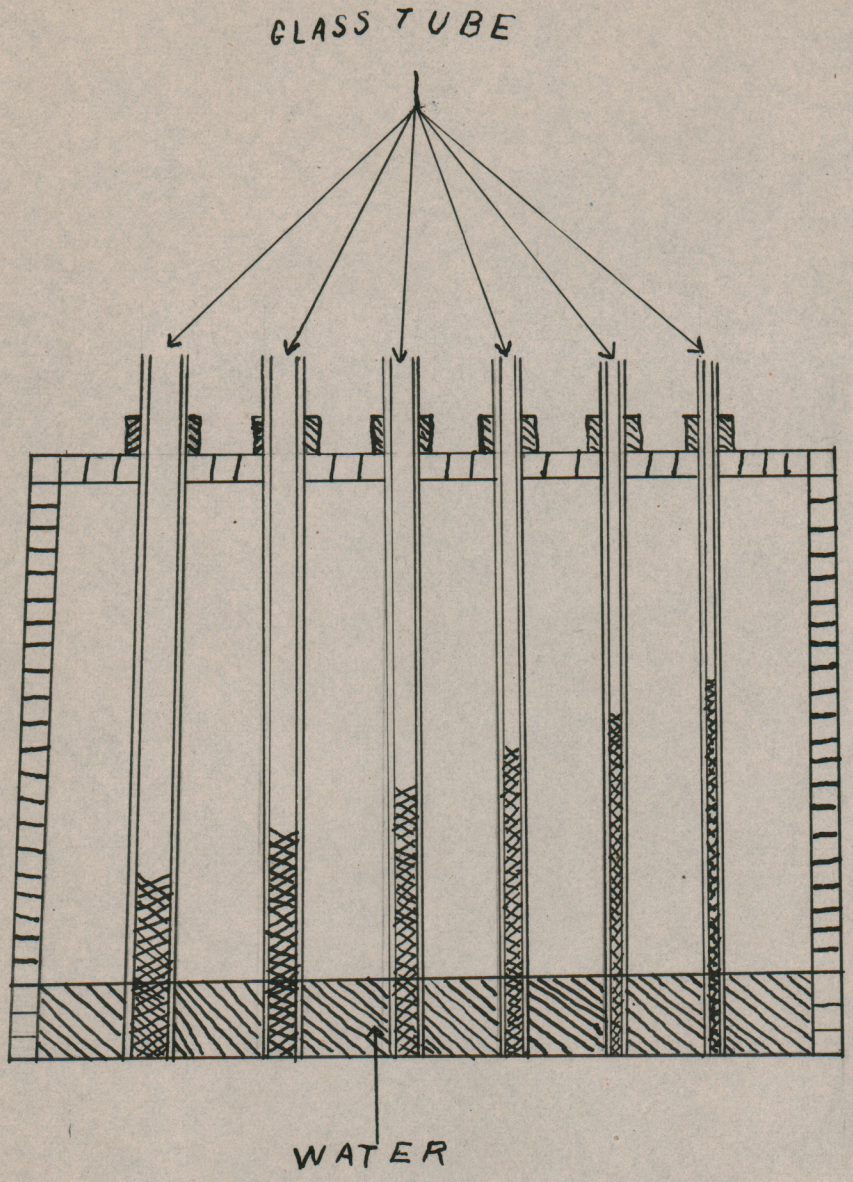


# EXPERIMENT
# NO II
# PHYSICS

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# EXPERIMENT NO. 3.
## LABORATORY

| | |
|---|---|
| OBJECT | To illustrate Surface Tension. |
| APPARATUS | A glass tube supported vertically in water. |
| PROCEDURE | I placed tube in water as illustrated. |
| OBSERVATION | I observed that the water rises with a concave surface upward. |
| CONCLUSION | I concluded that the attraction of glass for water is greater than the attraction of water for itself. |

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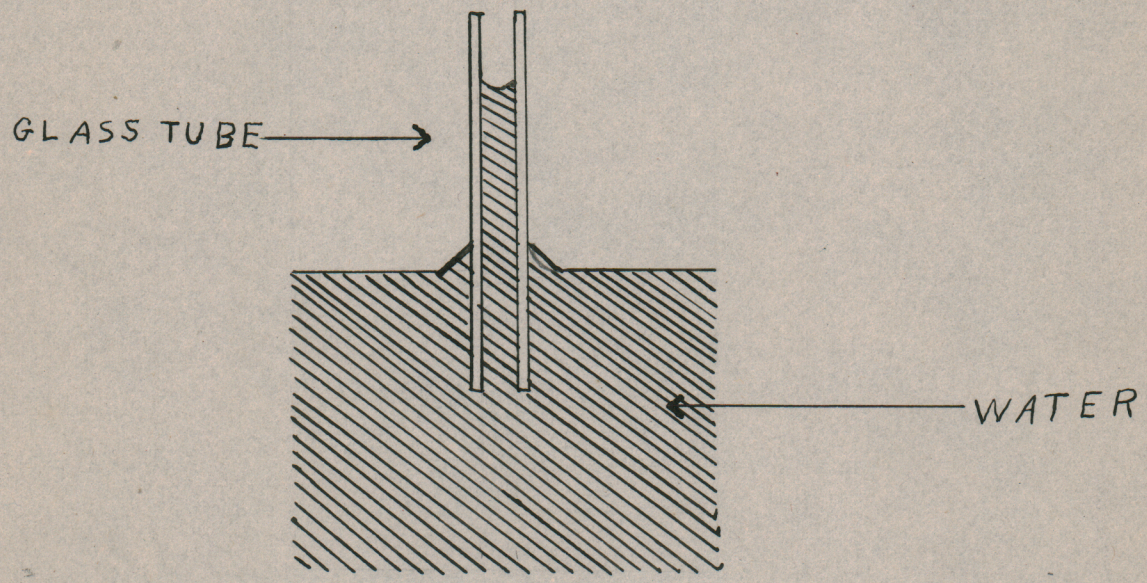


# EXPERIMENT
# NO III
# PHYSICS

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# EXPERIMENT NO. 4.

## EXPLANATION

The hydraulic press.

A heavy piston P works water tight in the large cylinder A while in the small one the piston p is moved like a force pump; it pumps water from the reservoir D and forces it through the tube C into the cylinder A. When the piston p of the pump is forced down, the liquid transmits the pressure to the base of the larger piston, on which the force R is as many times the force E applied to p as the area of the large one is greater than the area of the small one.

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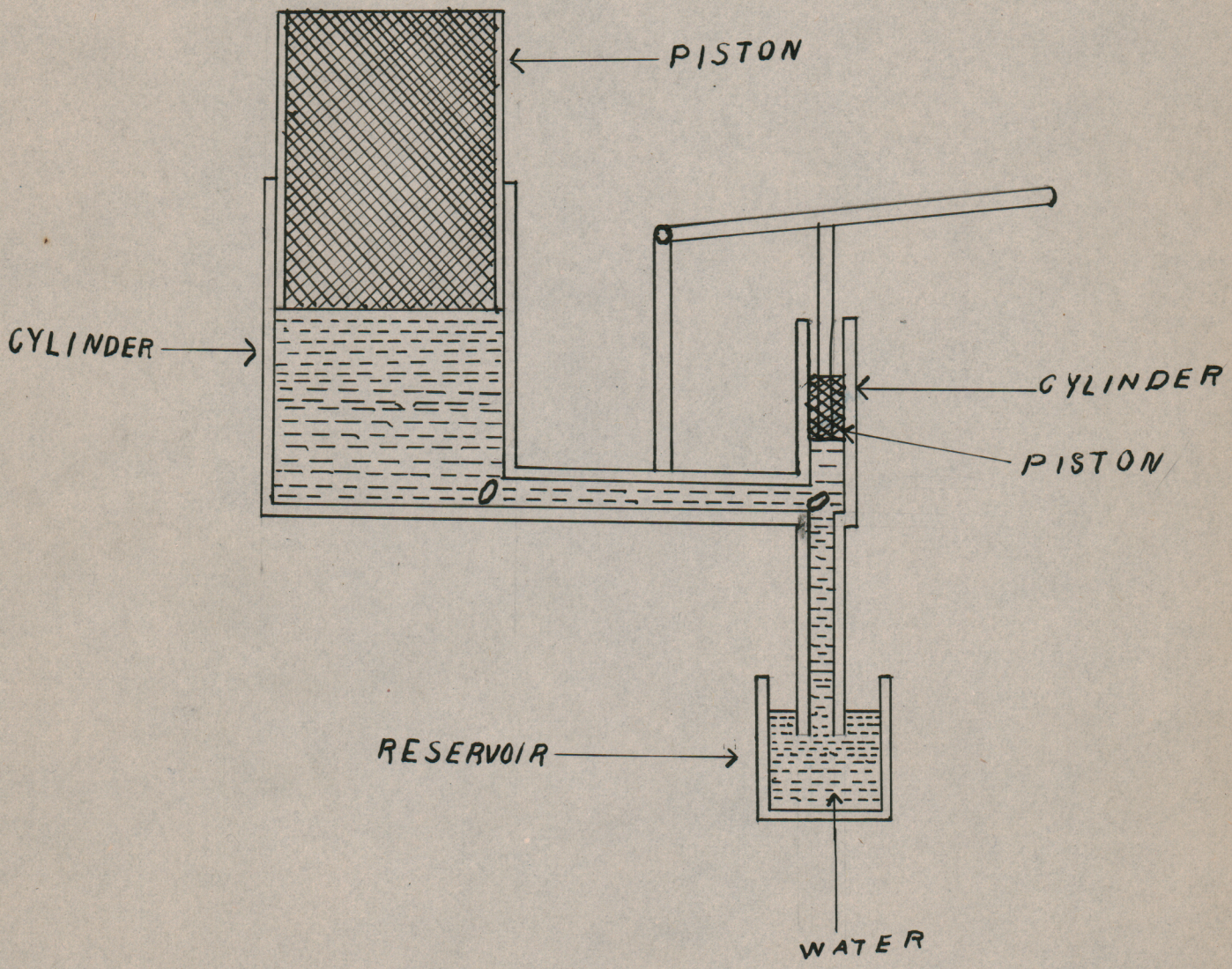


# EXPERIMENT

## NO IV

## PHYSICS

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# EXPERIMENT NO. 5.

## EXPLANATION

The hydraulic elevator.

A large piston P carries the cage A which runs up and down between the guides and is partly counterbalanced by a weight W. The piston runs in a tube or pit sunk to a depth equal to the height to which the cage is designed to rise. Water under pressure enters the pit from the pipe m through the valve v. Turned in one direction the valve admits water to the sunken cylinder, and the pressure forces the piston up; turned in the other direction it allows the water to escape into the sewer, and the elevator descends by its own weight.

# HYDRAULIC ELEVATOR

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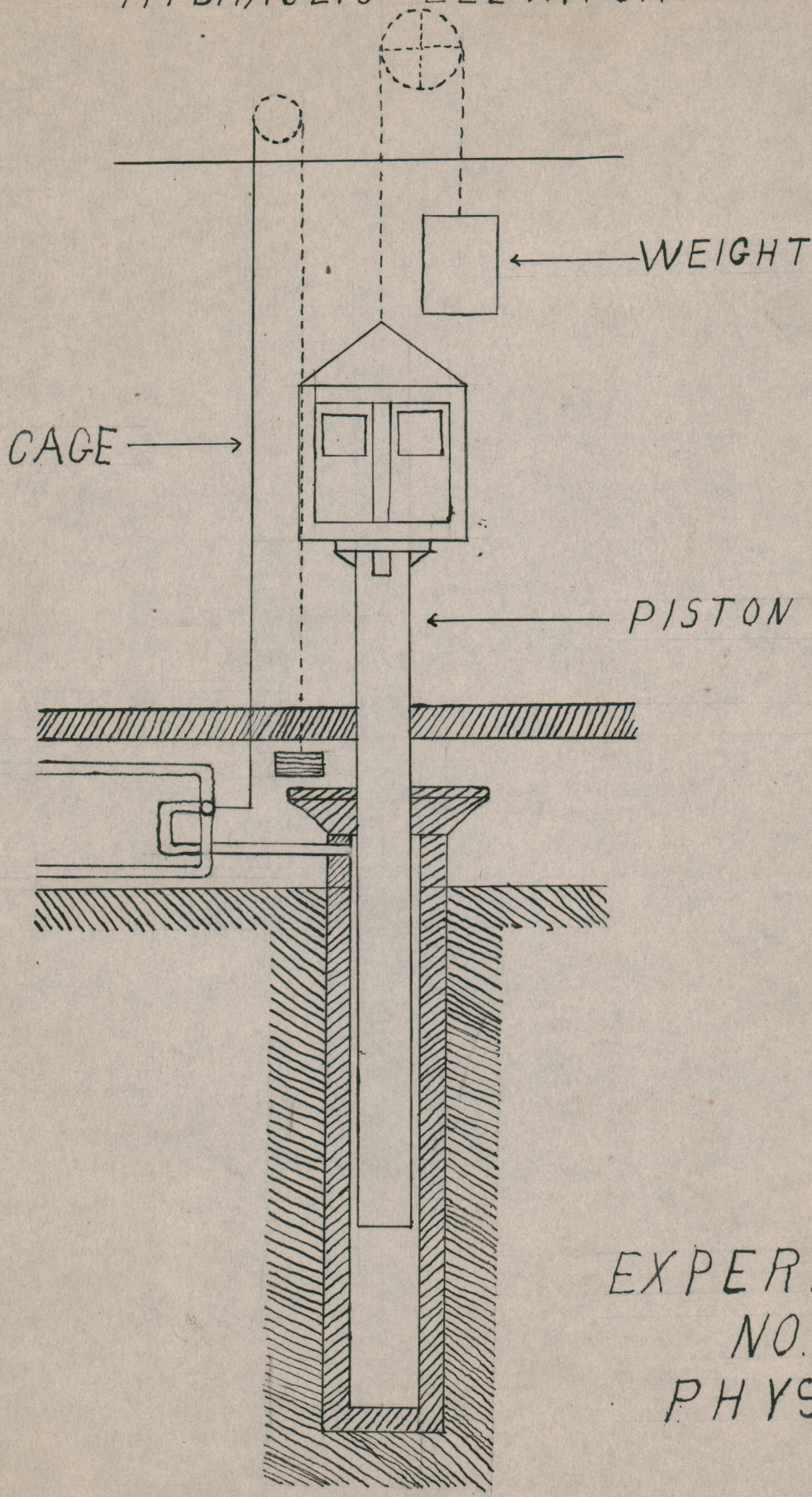


EXPERIMENT
NO. 5
PHYSICS

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# EXPERIMENT NO 6.
## LABORATORY

HAMMERMILL BOND

**OBJECT** To show the escpelled air from a bubble will blow a flame aside.

**APPARATUS** Candle-holder, funnel

**REAGENTS** Soap-suds and candle

**PROCEDURE** I placed a lighted candle in the holder and then placed a soap bubble blown on a funnel, so that the little end of the funnel was toward the flame

**OBSERVATION** When the small end of the funnel was close to the flame the flame was blown to one side and the bubble diminished in size.

**CONCLUSION** The soap-bubble while diminishing forced a draught of air through the funnel sufficiently great to move the flame.

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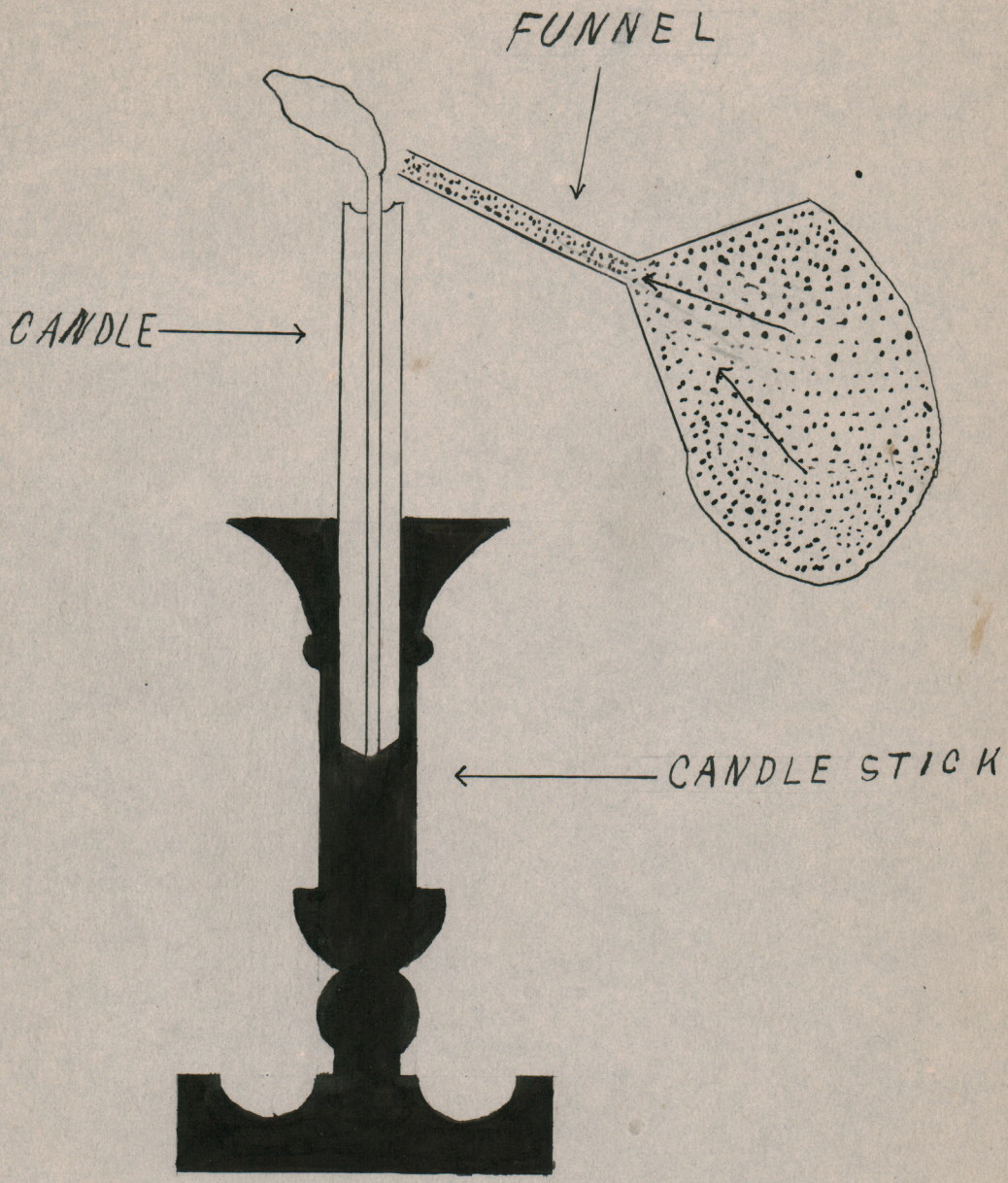
# SURFACE TENSION




## EXPERIMENT.
## NO.6.
## PHYSICS

OCT. 19 1916.

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# EXPERIMENT · NO · 7 ·
## EXPLANATION

Hydrometer.

The common hydrometer is generally glass and consists of a cylindrical stem and a mercury bulb to make it sink to the required level. The stem is graduated so that readings can be taken at the surface of the liquid in which it floats. This reading gives the density.

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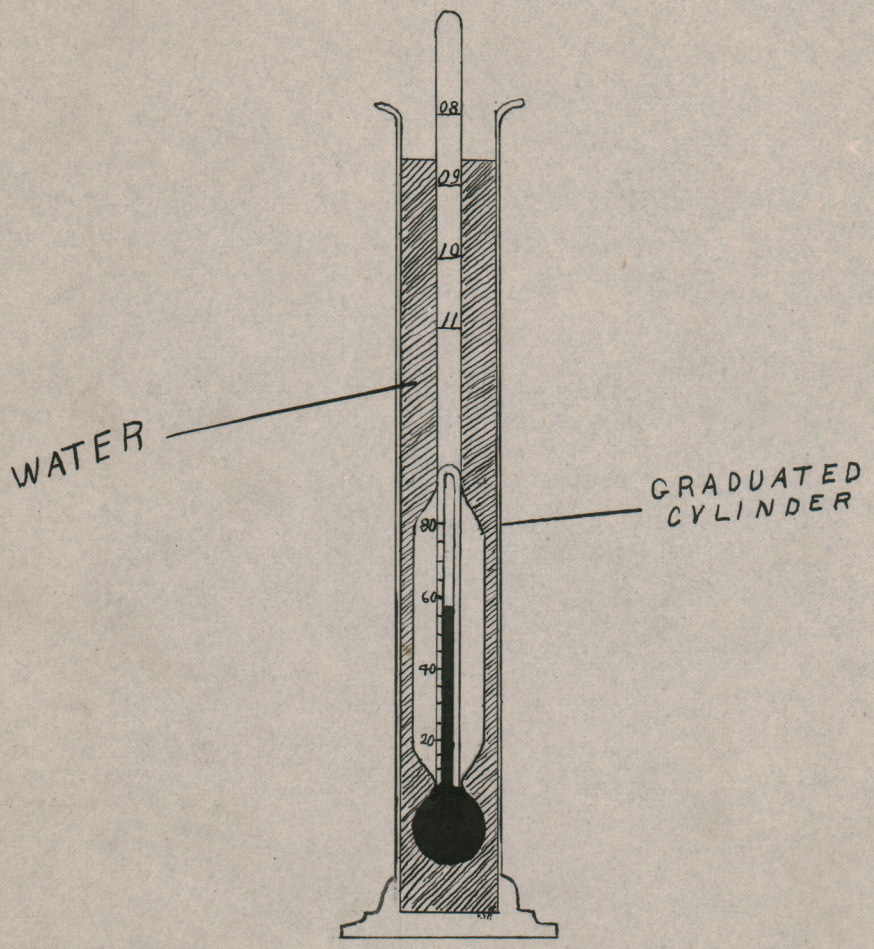


# EXPERIMENT NO.7
## LABORATORY
## PHYSICS

OCTOBER 22 1916

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# EXPERIMENT NO·8
## LABORATO PY

| | |
|---|---|
| OBJECT | To illustrate distilation. |
| APPARATUS | A bunsen burner, ring stand, water jacket, glass tube, flask and graduate. |
| REAGENTS | Alcohol and iodine and water. |
| PROCEDURE | I placed Alcohol and iodine in flask as illustrated and lit the gas. |
| OBSERVATION | I observed that the alcohol and iodine passed into the glass tube in the form of a vapor and that the water running through the jacket cooled it and it dropped into the graduate in the form of tincture of iodine. |
| CONCLUSION | I concluded that a liquid in the form of a vapor will condense into a liquid when coming in contact with a cold surface. |

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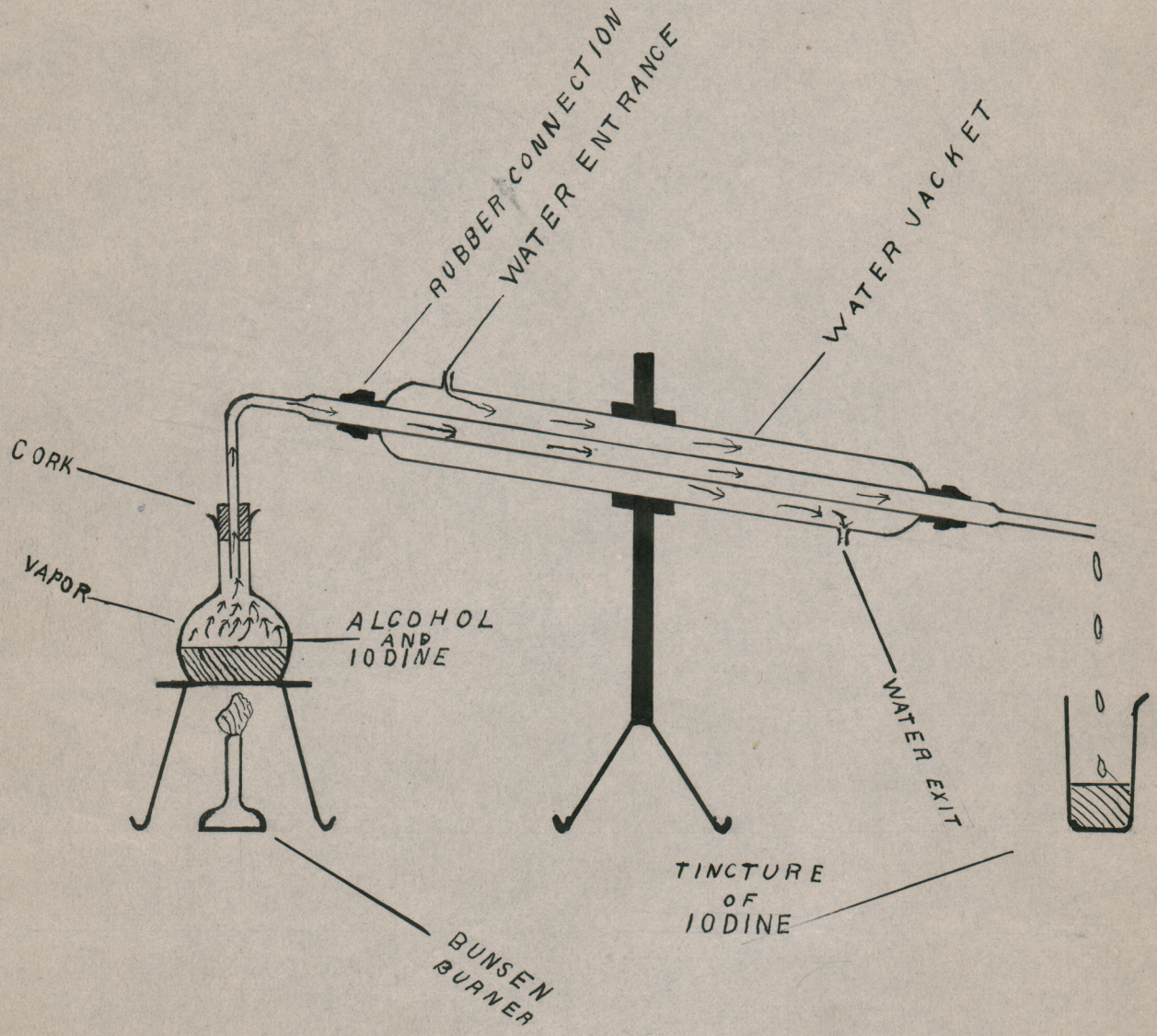


# EXPERIMENT NO 8
# LABORATORY
# PHYSICS

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# EXPERIMENT NO. 9.
## LABORATORY

HAMMERMILL BOND

**OBJECT** To show the difference between a chemical and a physical change

**APPARATUS** One test tube, a bunsen burner, a magnet, and two glass plates

**REAGENTS** Iron powder and sulphur

**PROCEEDURE A** I mixed the iron and sulphur on glass plate and then seperated it by holding a magnate near the mixture and attracting the iron to it.

**B** I again mixed the iron and sulphur and held it over flame in test tube until it became a red hot liquid, then I allowed it to cool and then I applied the magnet which had no effect upon the substance

**OBSERVATION A** I observed that after the first mixing that a magnet attracted the iron and drew it away from sulphur.

**B** I observed that after the substance had been heated the magnd had no effect what-ever upon the iron in the substance.

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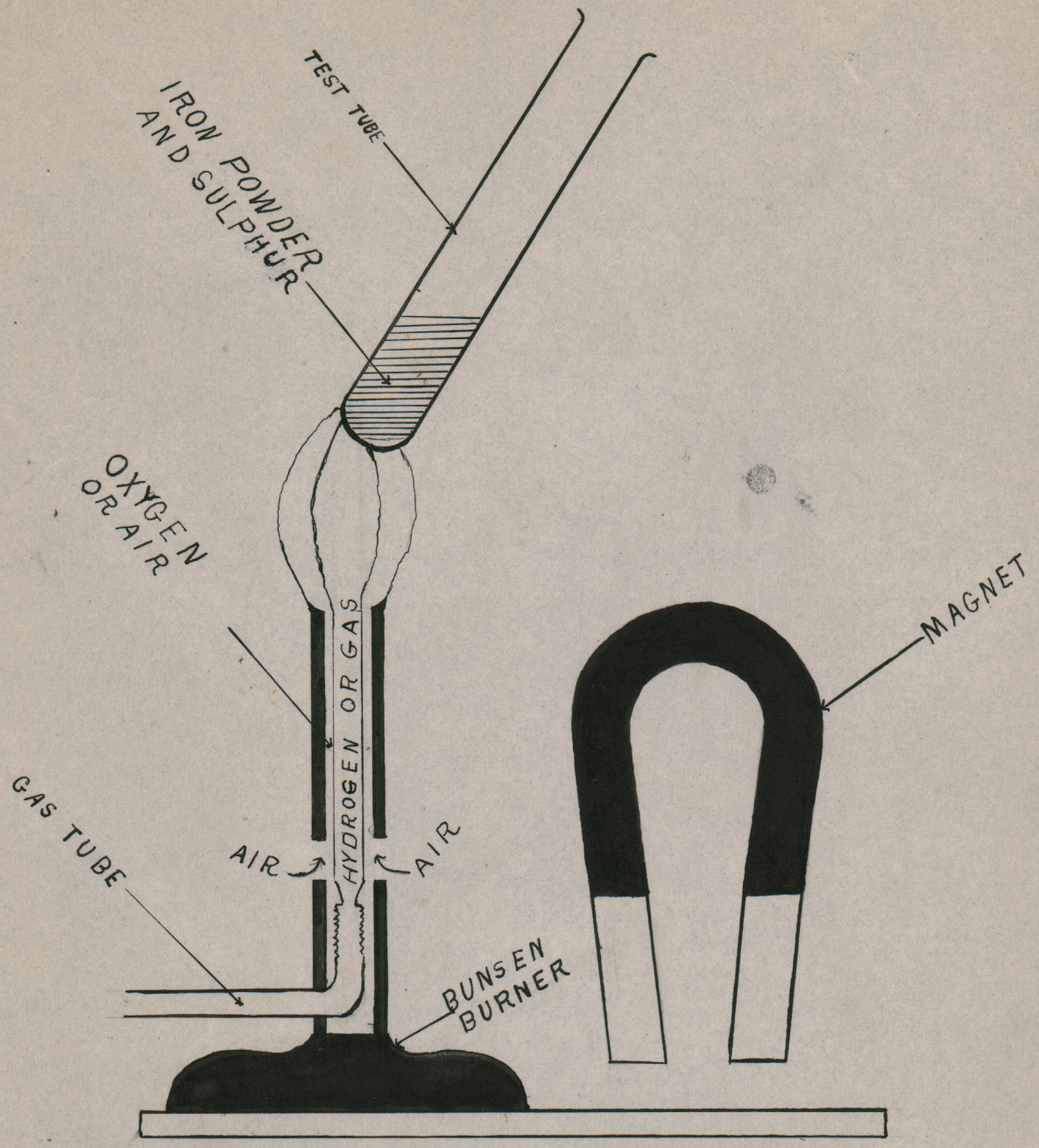


# EXPERIMENT NO. 9

## LABORATORY

## PHYSICS

NOV. 15, 1916.

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# EXPERIMENT NO·10
## LABORATORY

| | |
|---|---|
| OBJECT | To illustrate impenitrability. |
| APPARATUS | Two glass graduate cylinders. |
| REAGENTS | Water and lump of coal. |
| PROCEDURE | I placed equal amounts of water in both cylinders and placed lump of coal in the one. |
| OBSERVATION | I observed that the reading at the surface of the water was more in the one with the coal. |
| CONCLUSION | I concluded that no two bodies can occupy the same space at the same time. |

HAMMERMILL BOND

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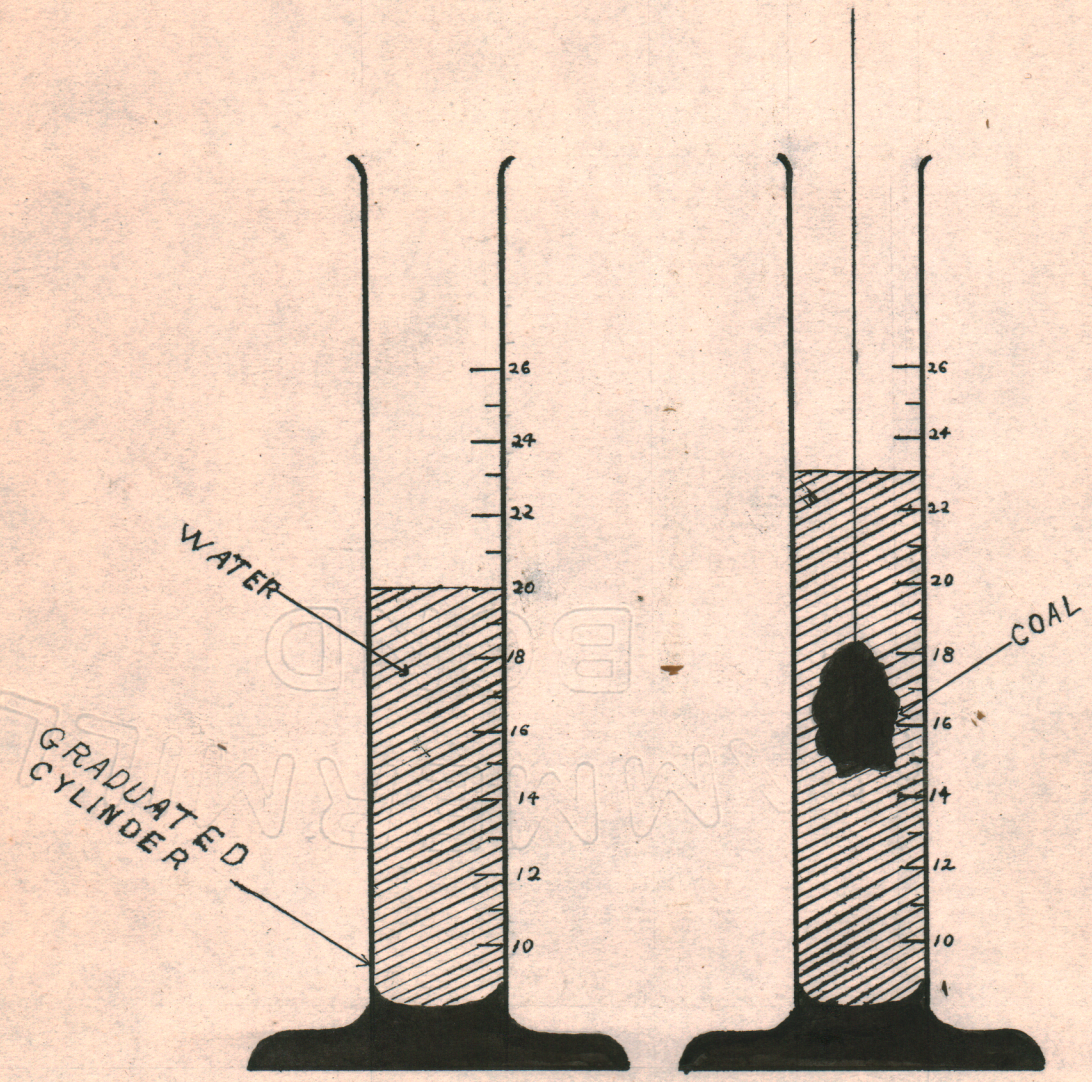


# EXPERIMENT NO. 10.

## LABORATORY PHYSICS

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# EXPERIMENT NO·11·
## LABORATORY

| | |
|---|---|
| OBJECT | To illustrate diffusion of ligquids. |
| APPARATUS | Graduate cylinder and thistle tube. |
| REAGENTS | Blue litmus water and sulphuric acid. |
| PROCEDURE | I placed the litmus water in the cylinder and introduced the acid into the cylinder at the bottom by the meanes of a thistle tube as illustrated. |
| OBSERVATION | I observed that the litmus water began to turn red and after several hours it was all red |
| CONCLUSION | I conclude that the molicules of a ligquid has freedom of motion and that ligquids will diffuse into one another. |

HAMMERMILL BOND

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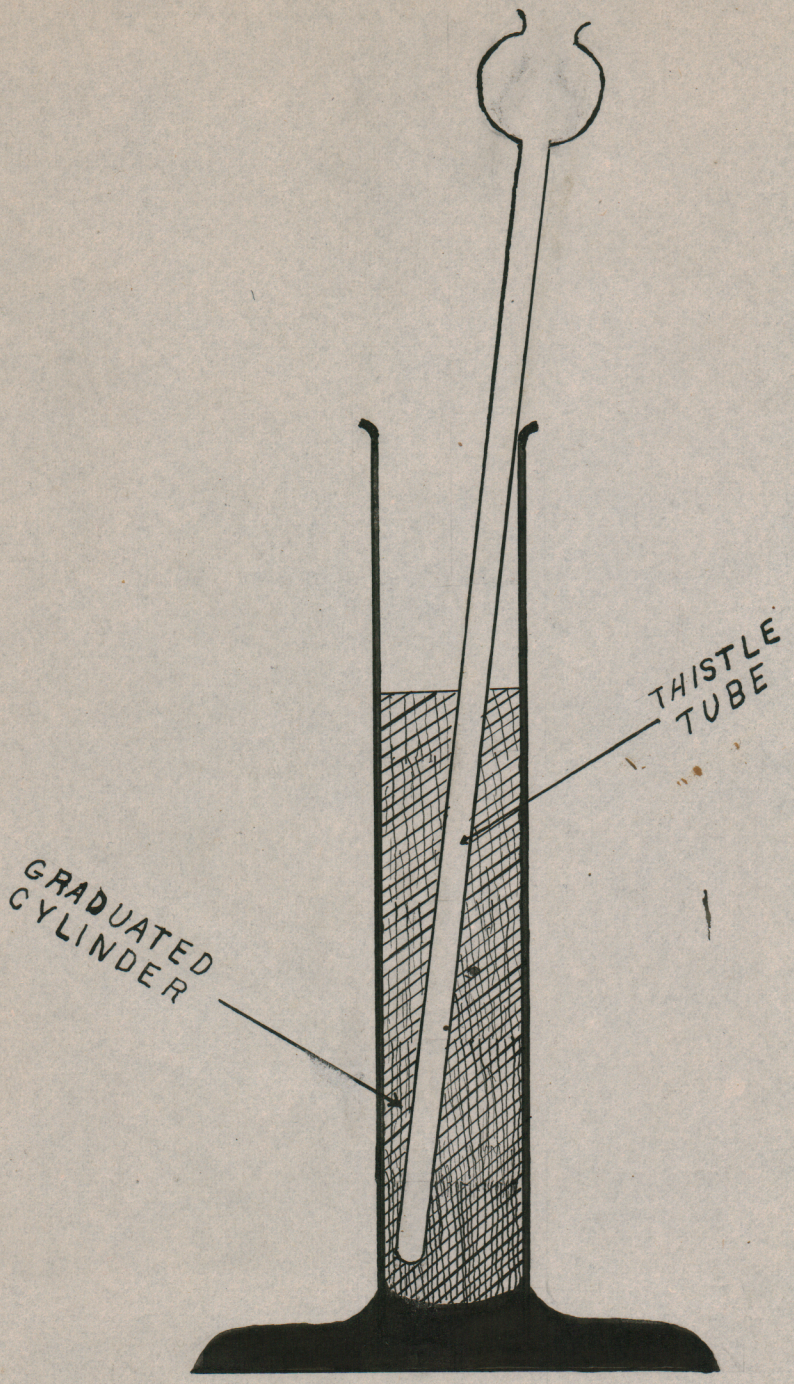


# EXPERIMENT NO. 11.

## LABORATORY

## PHYSICS

NOV. 15, 1916

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# EXPERIMENT NO. 12
## LABORATORY

| | |
|---|---|
| OBJECT | To illustrate inertia. |
| APPARATUS | Heavy weight and cotton string. |
| PROCEDURE | I suspended a heavy weight by a cotton string as illustrated and tied a piece of the same string to the under side of the weight. |
| OBSERVATION | I observed that a steady downward pull at B will break the upper string and that a sudden downward pull will break the lower string. |
| CONCLUSION | I concluded on account of the inertia of the weight the sudden pull would break the lower string before the pull reached the upper one. |

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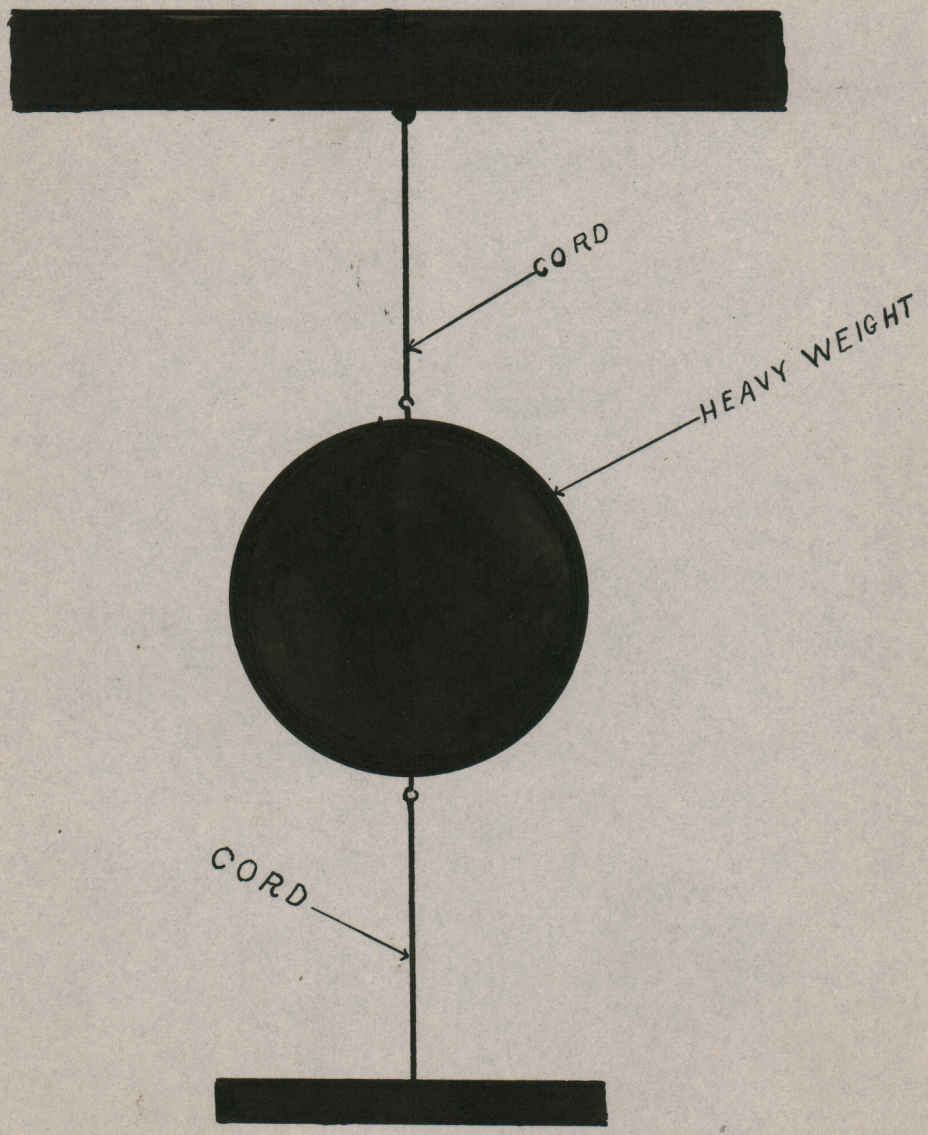
# INERTIA




## EXPERIMENT NO. 12.

LABORATORY
PHYSICS

NOV. 15, 1916.

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# EXPERIMENT NO. 13
## LABORATORY

**OBJECT** To illustrate Hook's law.

**APPARATUS** meter stick, clamps and box.

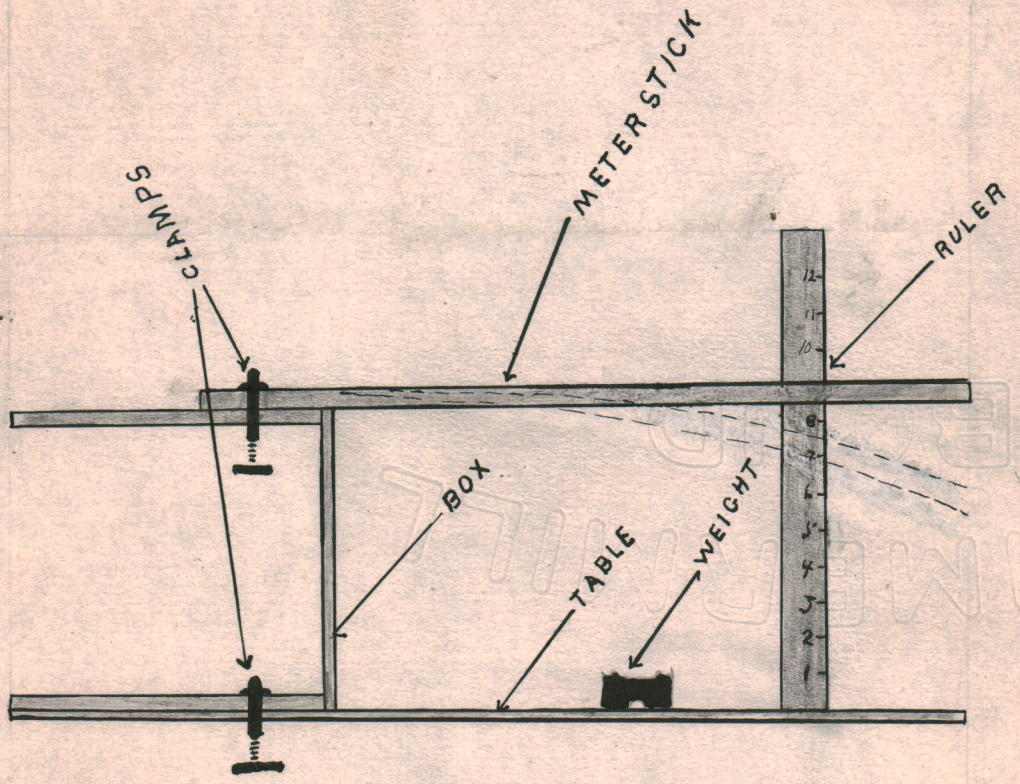
**PROCEDURE** I clamped stick to box as illustrated and placed weights at the free end.

**OBSERVATION** I observed that when placing the weights on the end of the stick the amount of bending was proportional to the weight.

**CONCLUSION** I concluded that the distortion of any kind due to bending is proportional to force producing them.

HAMMERMILL BOND

# ELASTICITY




## EXPERIMENT NO. 13

LABORATORY

PHYSICS

NOV. 18, 1916

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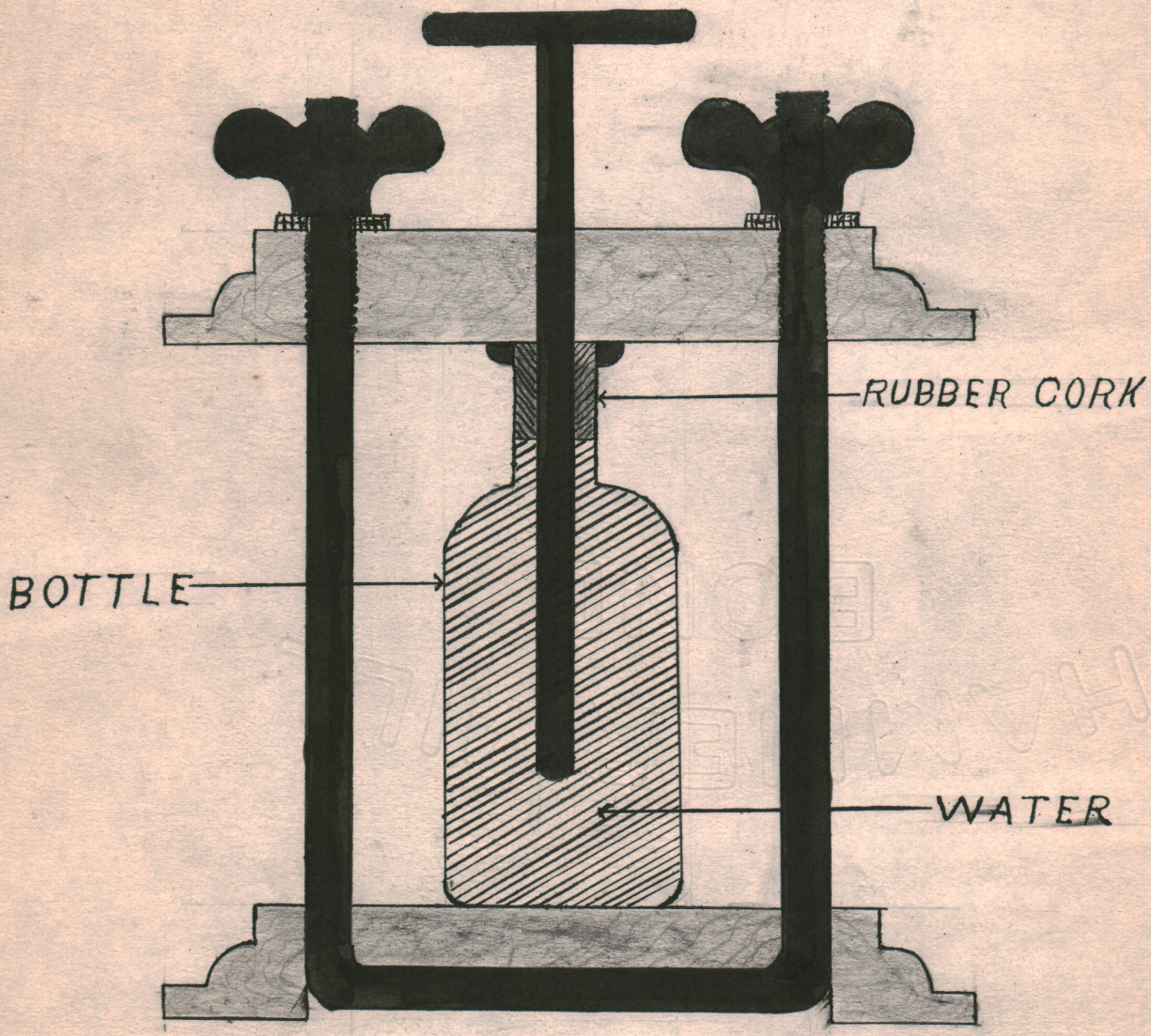
# EXPERIMENT NO. 14
## LABRATORY

| | |
|---|---|
| OBJECT | To illustrate non-compressibility of water. |
| APPARATUS | Bottle, rubber stopper, and frame. |
| REAGENTS | Water |
| PROCEDURE | I filled bottle with water placed stopper in it and placed it in the frame as illustrated, with plunger in the hole in stopper. |
| OBSERVATION | I observed that when pressure was applied to the plunger that it remained the same. |
| CONCLUSION | I concluded that water was practicably non-compressible. |

# NON-COMPRESSIBILITY OF WATER




## EXPERIMENT NO.14

LABORATORY

PHYSICS

NOV. 23. 1916

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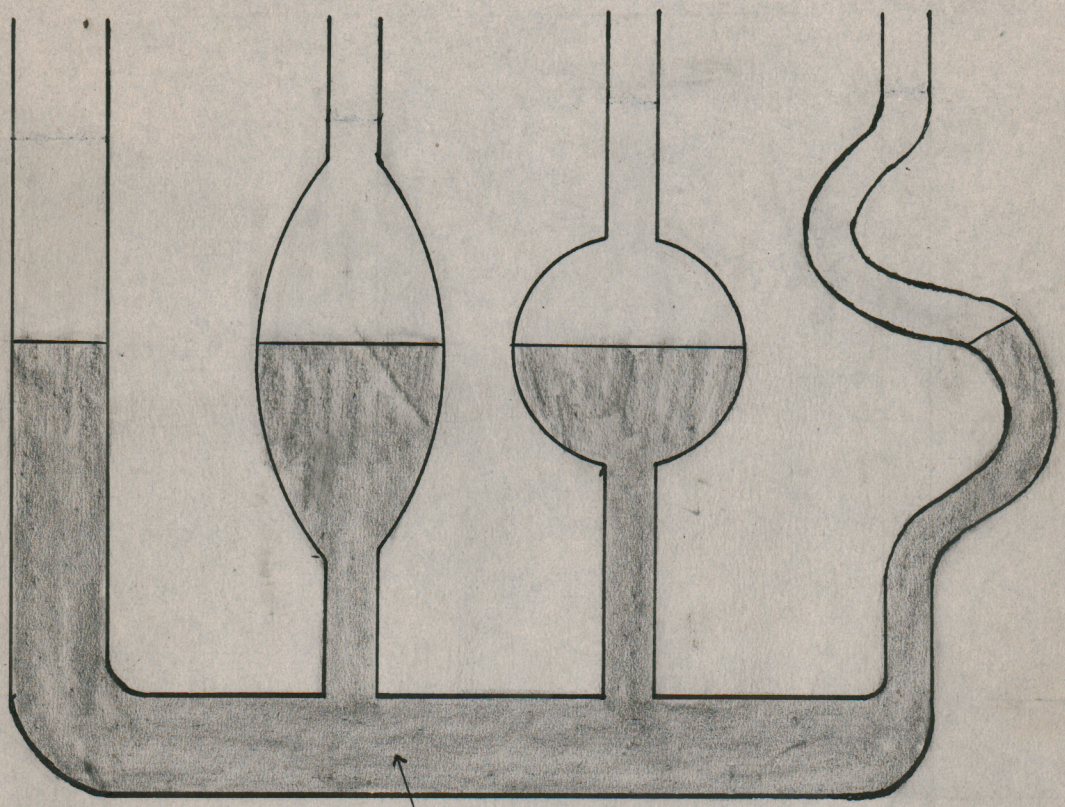
# EXPERIMENT NO. 15.

## EXPLANATION

Level of a liquid in connected vessels. The water in the apparatus rises to the same level in all branches of the vessel. There is equilibrium because the pressures on opposite sides of any cross section of the liquid in the connected tubes are equal, since they are due to liquid columns of the same height

# SURFACE OF A LIQUID IN CONNECTED VESSEL




## EXPERIMENT NO. 15

LABORATORY

PHYSICS

NOV. 23, 1916

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BOND

# EXPERIMENT NO. 16.

## EXPLANATION

### The siphon

The siphon is a U-shaped tube employed to convey liquids from one vessel to another at a lower level by means of atmospheric pressure. If the siphon is filled and is placed in the position as illustrated, the liquid will flow out of the vessel into the lower one. The air pressure causes this.

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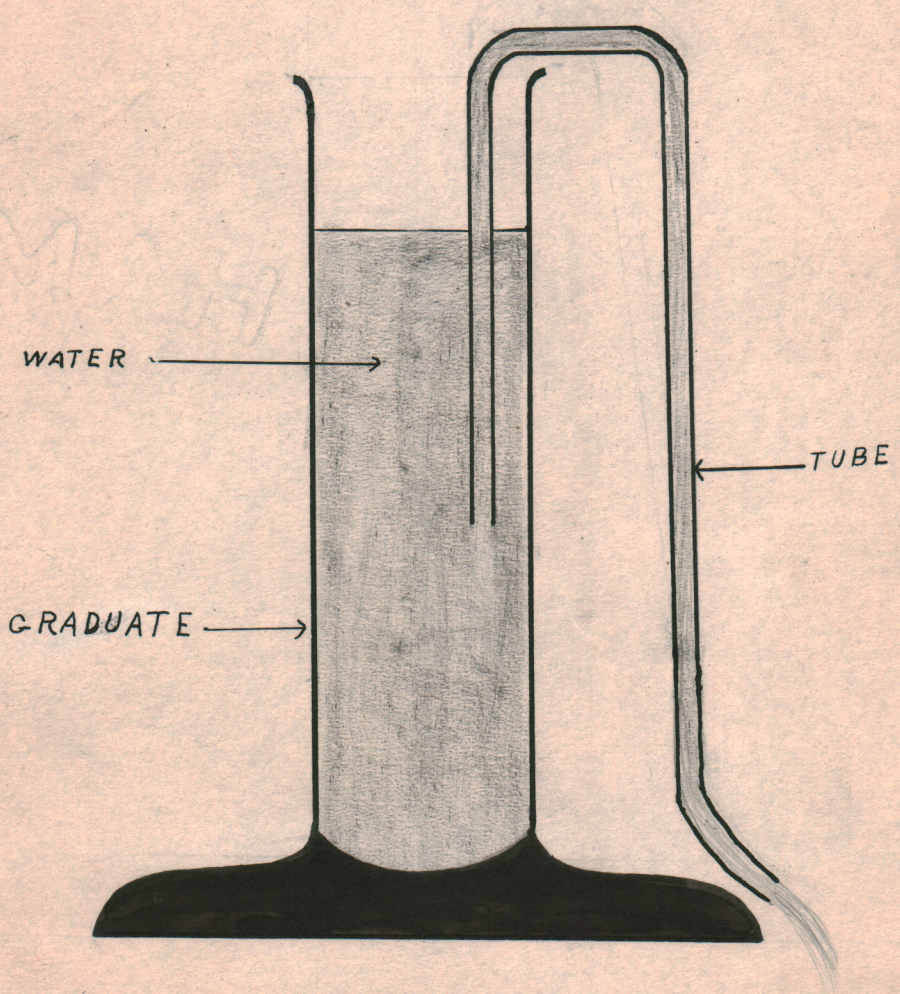
BOND

# SIPHON




## EXPERIMENT NO. 16
## LABORATORY
## PHYSICS.

DEC. 6, 1916.

H.L. BRANSON

BOND

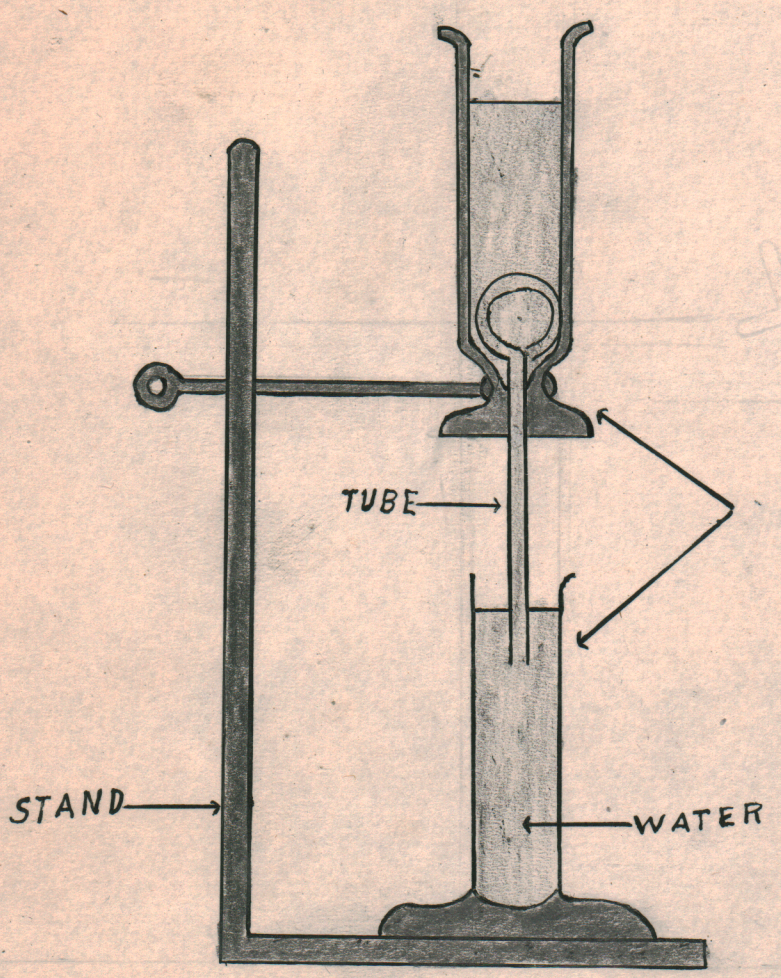
# EXPERIMENT NO. 17.

## EXPLANATION

The intermittent siphon. This siphon has a short arm inside a vase and its long arm passes through the bottom. The container holds water until the water reaches the top of the bend of the siphon then the water is discharged. It stops when the water becomes lower than the bent arm.

HAMMERMILL
BOND

# INTERMITTENT SIPHON




## EXPERIMENT NO. 17
## LABORATORY
## PHYSICS

DEC. 5 1916

H.L. BRANSON

BOND

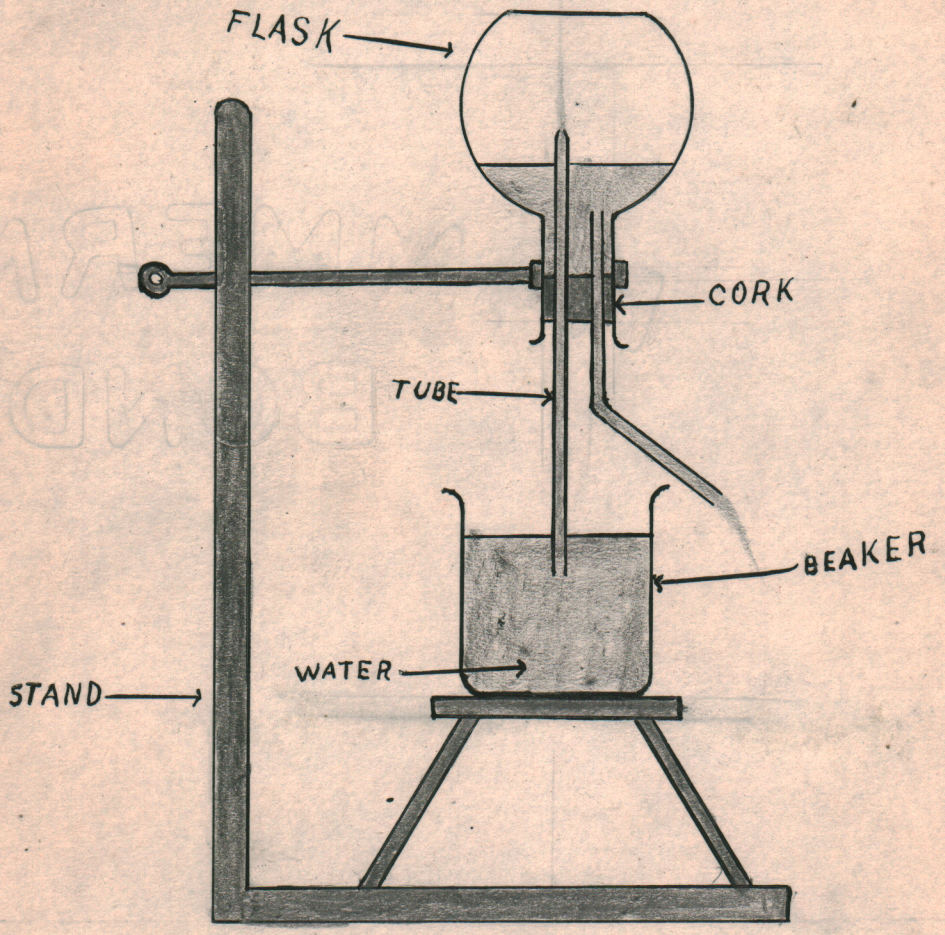
# EXPERIMENT NO. 18
## EXPLANATION

Vacuum Siphon.

The vacuum siphon is made with a Florence flask, beaker and glass tubing. The flask is partly filled with water and the apparatus is then inverted as shown. The water enters the flask as a jet.

HAMMERMILL BOND

# VACUUM SIPHON




## EXPERIMENT NO 18
## LABORATORY
## PHYSICS

DEC. 5. 1916

H.L. BRANSON

# EXPERIMENT NO. 19
## LABORATORY

**OBJECT** To illustrate parallel forces.

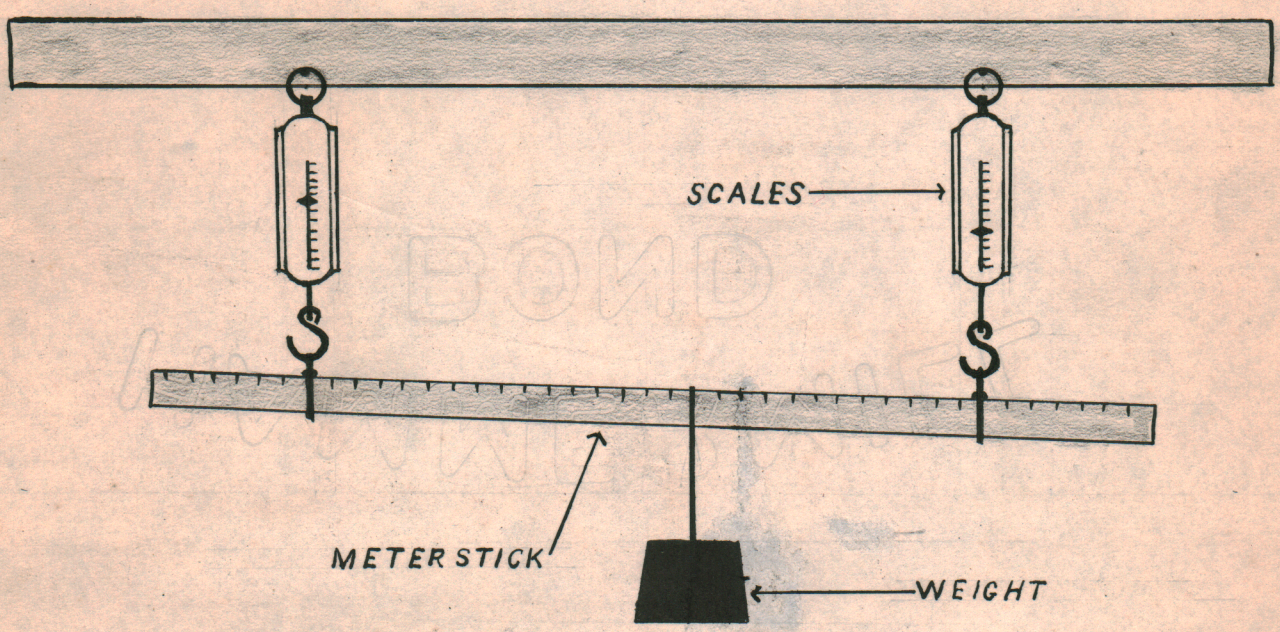
**APPARATUS** Two draw scales, meter stick, and weight.

**PROCEDURE** I suspended the scales from bar and attached meter stick and weight as illustrated.

**OBSERVATION** I observed that the sum of the readings of the scales was equal to the weight and that the lesser reading on the scales was proportional to the short side of the meter stick and that the larger reading was proportional to long side of the meter stick.

**CONCLUSION** I concluded that the resultant of two parallel forces in the same direction is equal to their sum; its point of application divides the line joining the points of application of the two forces into two parts which are inversely as the forces.

# PARALLEL FORCES




## EXPERIMENT NO. 19
## LABORATORY
## PHYSICS

JAN. 9. 1917

H. L. BRANSON.

# EXPERIMENT NO. 20.
## LABORATORY

**OBJECT** To illustrate two forces acting at an angle.

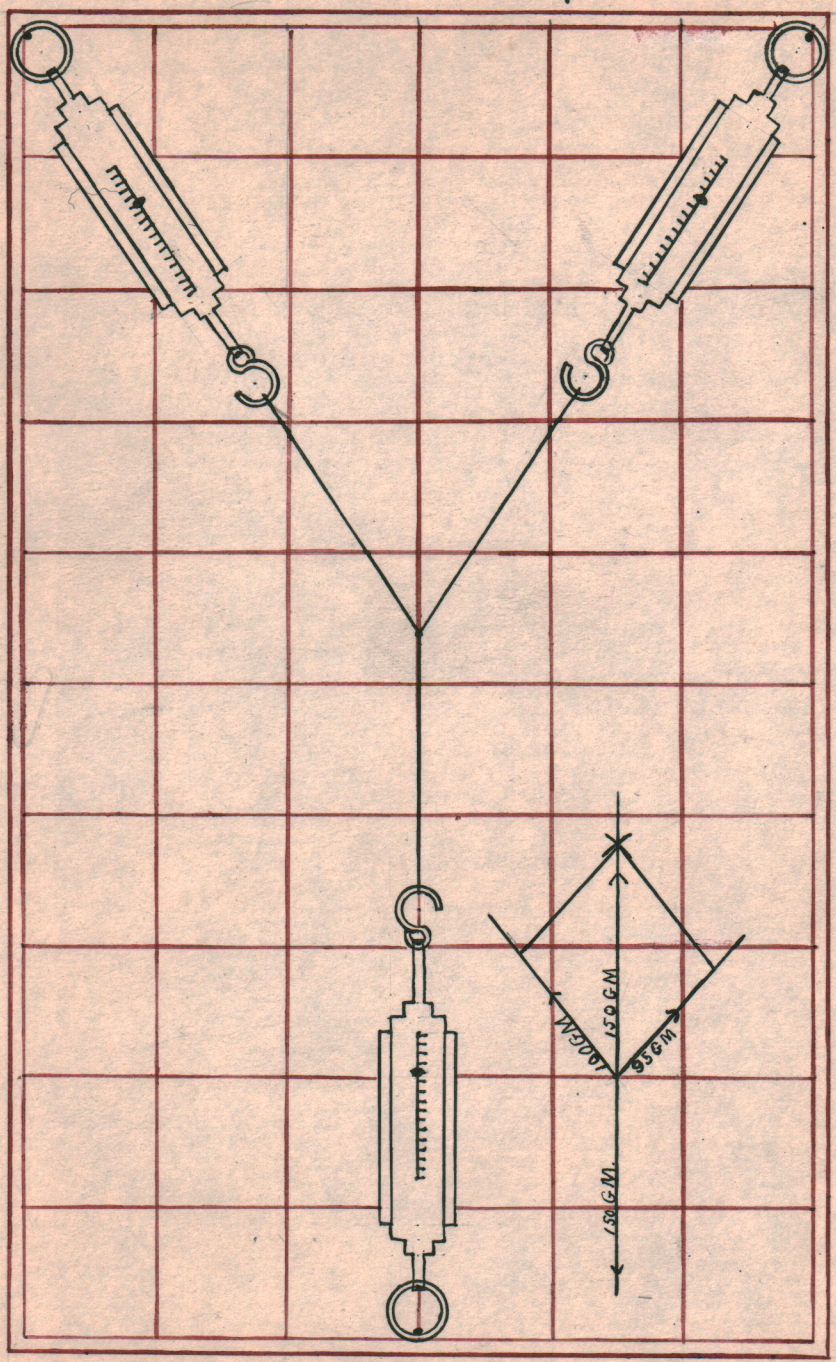
**APPARATUS** Three draw scales and cords.

**PROCEDURE** I tied three cord togather and fastened them to the scales and placed the rings of the scales over nails in a board at such a distance apart that all the scales were stretched as illustrated.

**OBSERVATION** I observed that the sum of the readings on the two scales at an angle was equal to the reading on the other one.

**CONCLUSION** I concluded that the resultant of two forces acting at an angle to each other may be found by completing the parallelogram upon the forces as sides and drawing a diagonal from the common point of application.

# RESULTENT OF TWO FORCES ACTING AT AN ANGLE




## EXPERIMENT NO. 20

LABORATORY

PHYSICS

JAN. 12, 1917.

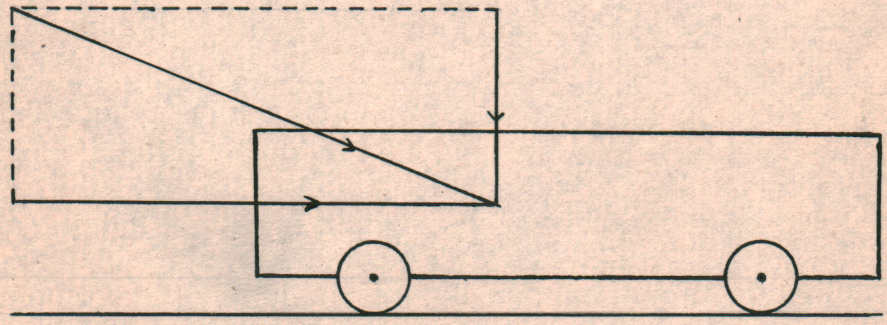
H. L. BRANSON

# EXPERIMENT NO. 21
## LABORATORY

| | |
|---|---|
| OBJECT | To show the component of a force. |
| APPARATUS | Car and force AB |
| PROCEDURE | I applied force AB to a car as shown by illustration. |
| OBSERVATION | I observed that the power given to the car was only the horizontal force. |
| CONCLUSION | I concluded that the component of a force in a given direction is its effective value in that direction |

HAMMERMILL BOND

# COMPONENT OF A FORCE



## EXPERIMENT NO. 21
## LABORATORY
## PHYSICS

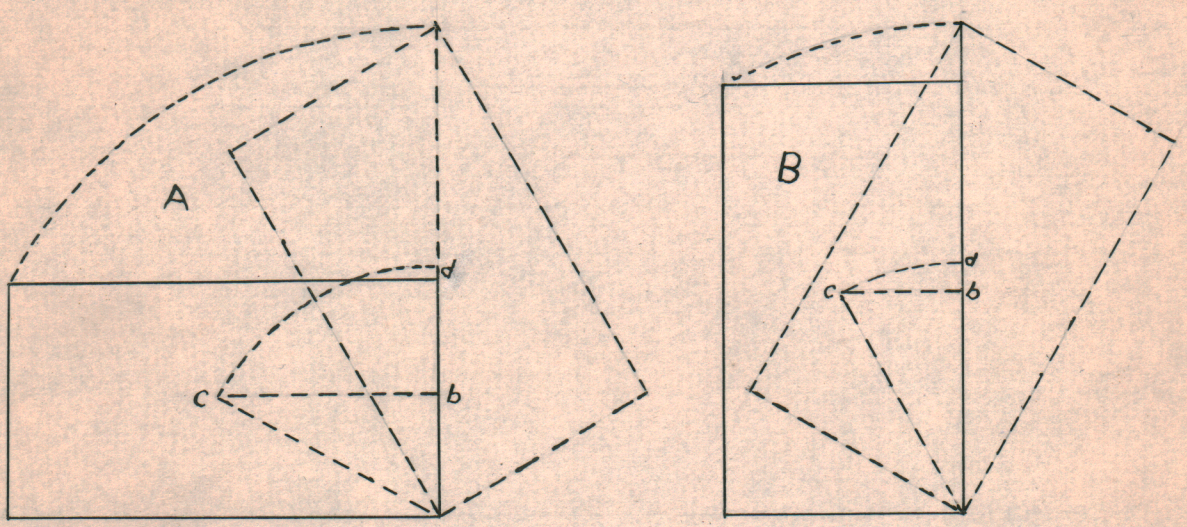
JAN. 26. 1917

H. L. BRANSON.

# EXPERIMENT NO. 22.
## LABORATORY

| | |
|---|---|
| OBJECT | To illustrate stability |
| APPARATUS | Brick. |
| PROCEDUPE | I placed brick in position as illustrated. |
| OBSERVATION | I observed that the brick has greater stability on its narrow side (2"X8") than when on its end (2"X4") and still more when on its broad side (4"X8"). |
| CONCLUSION | I concluded that the stability is greater when the center of gravity is low |

# STABILITY




## EXPERIMENT NO. 22
## LABORATORY
## PHYSICS

JAN. 23, 1917

H. L. BRANSON.

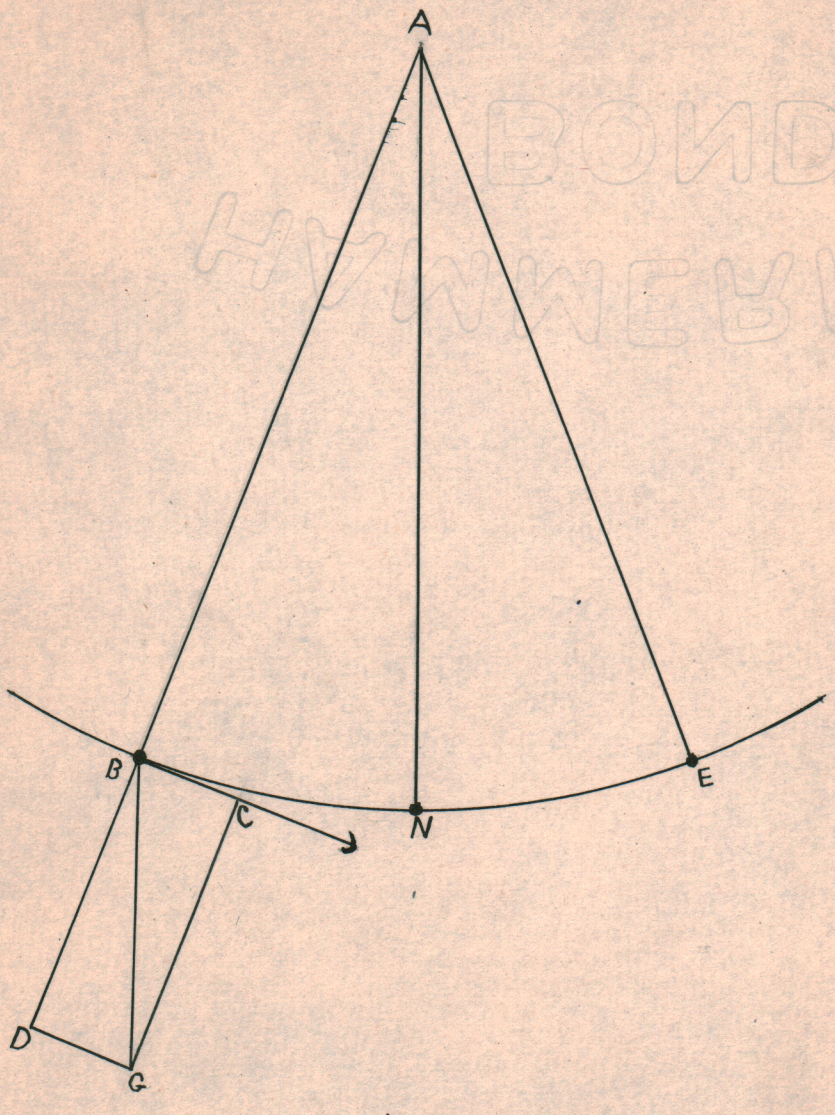
# EXPERIMENT NO. 23.

## LABORATORY

| | |
|---|---|
| OBJECT | To illustrate the motion of a pendulum. |
| APPARATUS | Simple pendulum |
| PROCEDURE | I placed pendulum in position AN and drew it aside in the position AB and AE. |
| OBSERVATION | I observed that the weight may be resolved into two components BD and BC. When the ball moves from B to N the component becomes smaller and vanishes at N where the whole weight is on the string. The ball is accelerated between B and N but not uniform. |
| CONCLUSION | I concluded that a pendulum oscillates with a periodic motion. |

HAMMERMILL BOND

# MOTION OF A PENDULUM




## EXPERIMENT NO. 23
## LABORATORY
## PHYSICS

JAN. 23, 1917.

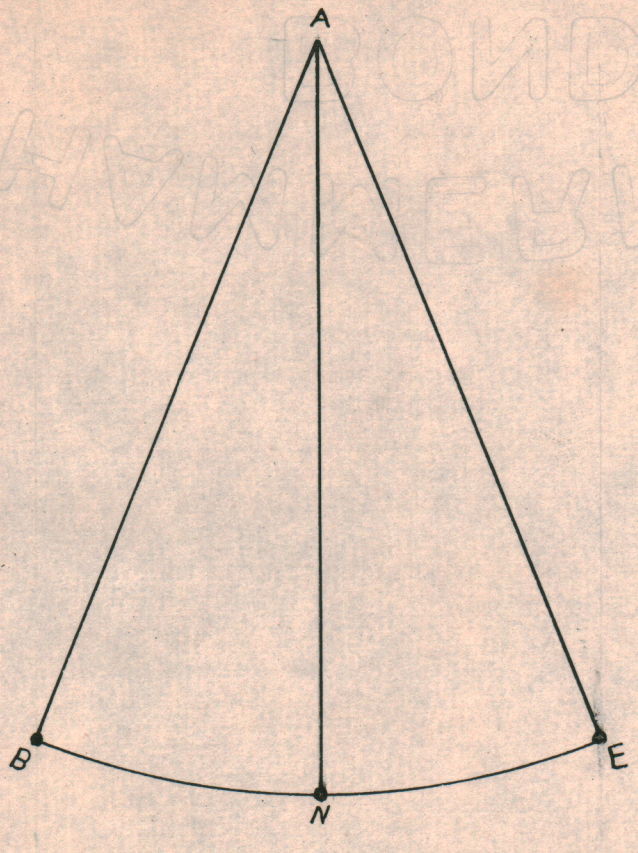
H.L. BRANSON.

# EXPERIMENT NO 24.

## EXPLANATION

The vibrations of the pendulum
A single vibration is the motion comprised between two successive passages of the pendulum through the lowest point of its path, as the motion from N to B as illustrated and back to N again. A complete or double vibration is the motion between two successive passages of the pendulum through the same point and going in the same direction. The period of vibration is the time consumed in making a complete vibration. The amplitude is the arc BN or the angle BAN

# VIBRATIONS OF THE PENDULUM




## EXPERIMENT NO. 24
LABORATORY
PHYSICS

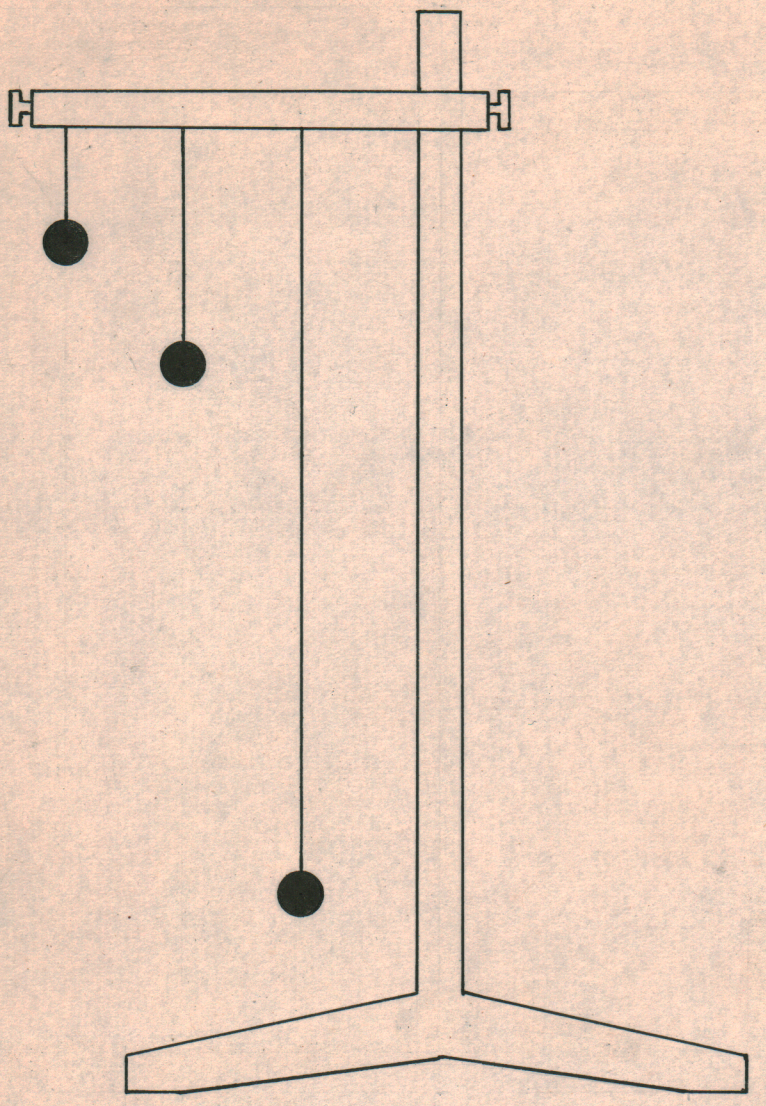
JAN. 25, 1917.

H.L. BRANSON.

# EXPERIMENT NO. 25
## LABORATORY

| | |
|---|---|
| OBJECT | To illustrate second law of the pendulum |
| APPARATUS | Three pendulums and frame |
| PROCEDURE | I placed the three pendulums on the frame making the lengths 1 m., 1/4 m., and 1/9 m respectively. |
| OBSERVATION | I observed that the period of a single vibration of each was 1 second, 1/2 second, and 1/3 second or in periods proportional to the square root of the lengths. |
| CONCLUSION | I concluded that the period of vibrational is proportional to the square root of the length. |

# SECOND LAW OF THE PENDULUM



## EXPERIMENT NO. 25

LABORATORY

PHYSICS.

JAN. 26, 1917

H.L. BRANSON.

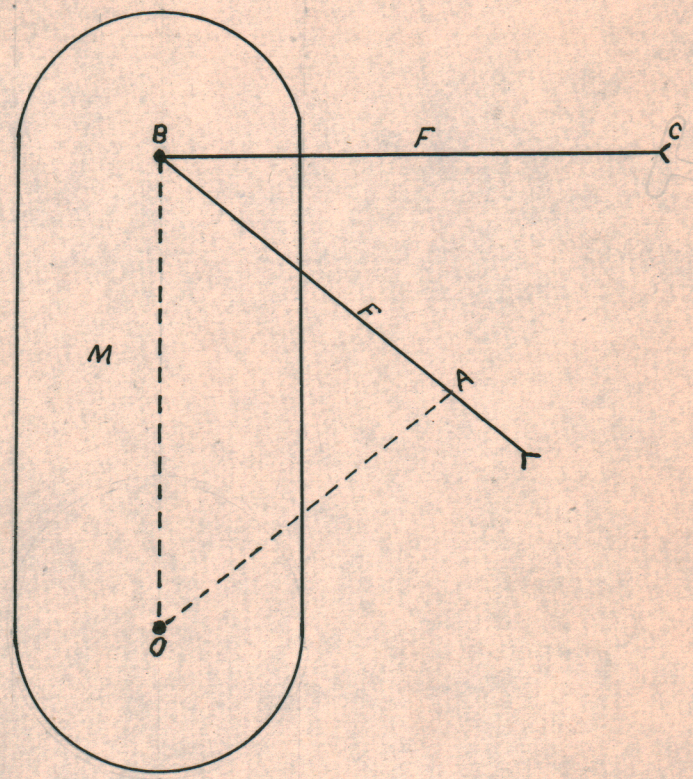
# EXPERIMENT · NO · 26 ·
## EXPLANATION

Moment of a force.

Let M be a body which may rotate about an axis through O as illustrated. The moment of the force F applied at B in the direction CB is F x OB; applied at in the direction AB, its moment is F x OA

HAMMERMILL BOND

# MOMENT OF A FORCE




## EXPERIMENT. NO. 26

LABORATORY

PHYSICS

JAN. 25, 1917

H. L. BRANSON

# EXPERIMENT · NO · 27 ·

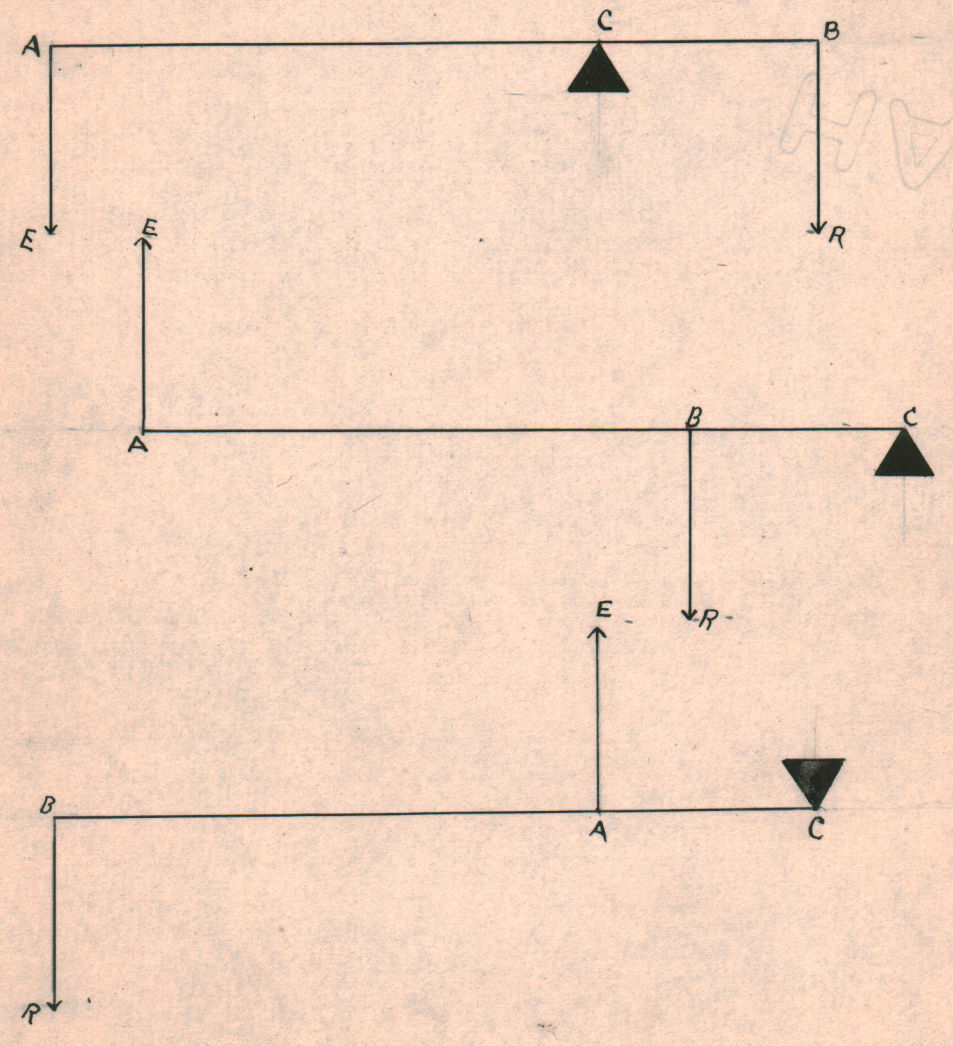
## EXPLANATION

HAMMERMILL BOND

The lever.

Levers are divided into three classes distinguished by the position of the fulcrum with respect to the two forces. In the first class the fulcrum is between E and R; in the second class the resistance is between the effort and fulcrum; in the third class the effort is between the resistance and the fulcrum.

# LEVERS




## EXPERIMENT NO. 27

LABORATORY

PHYSICS

JAN. 23, 1917

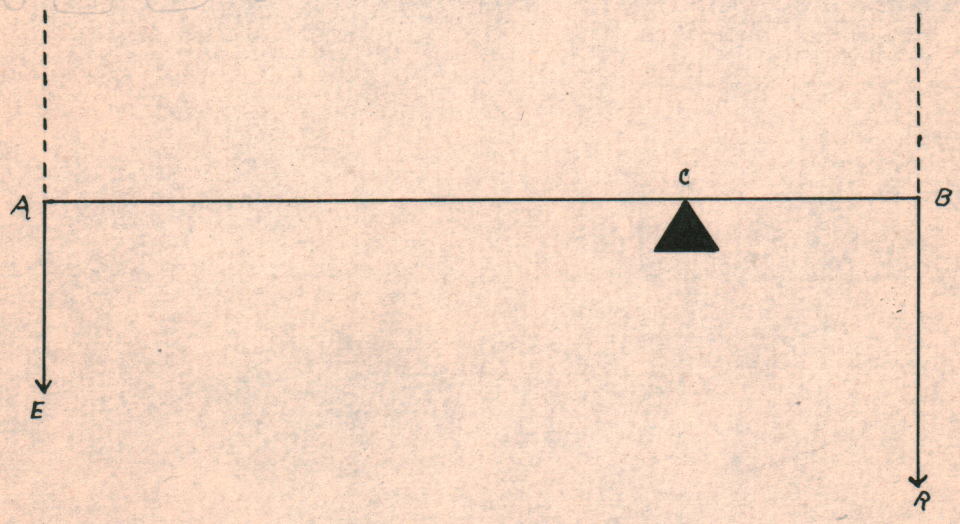
H.L. BRANSON.

# EXPERIMENT · NO · 28 ·
## EXPLANATION

HAMMERMILL
BOND

The lever
considering the lever to be weightless and to rotate about C without friction; then the moment of the force E about the fulcrum is EXAC, and that of the force R is RXBC. These two forces tend to produce rotation in opposite directions

# LEVER




## EXPERIMENT NO. 28

LABORATORY

PHYSICS

JAN. 25, 1917

H.L. BRANSON.

# EXPERIMENT NO. 29
## LABORATORY

**OBJECT**

To illustrate the mechanical advantage of the lever.

**APPARATUS**

Weights and scales

**PROCEDURE**

I placed the weights on the balanced bar as shown in illustration.

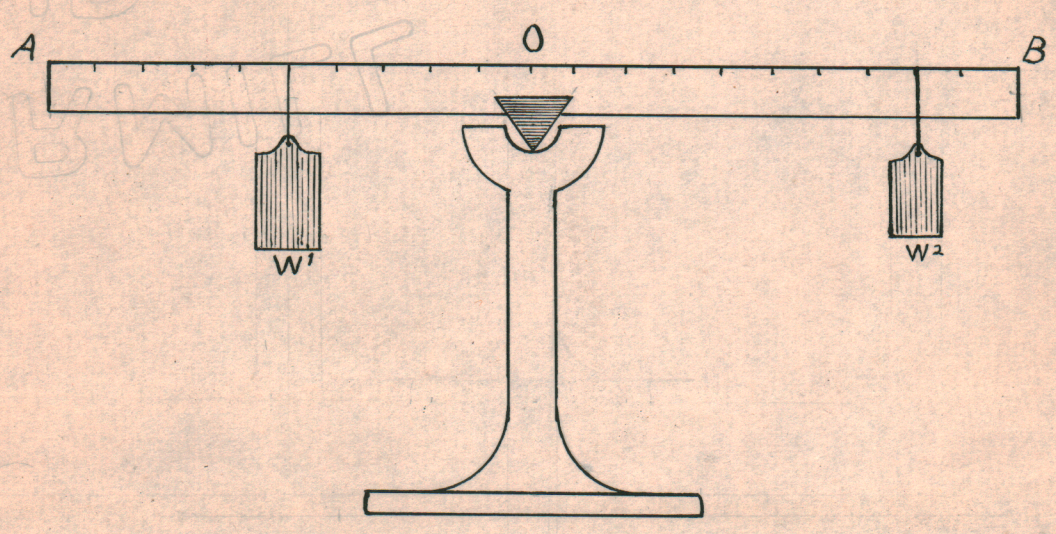
**OBSERVATION**

I observed that the smaller weight had to be placed farther out on the bar to balance the larger one.

**CONCLUSION**

I concluded that the mechanical advantage of the lever equals the inverse ratio of its arms.

# MECHANICAL ADVANTAGE OF THE LEVER




## EXPERIMENT NO. 29
## LABORATORY
## PHYSICS

JAN. 24, 1917.

H. L. BRANSON

# EXPERIMENT · NO · 30 ·
## EXPLANATION.

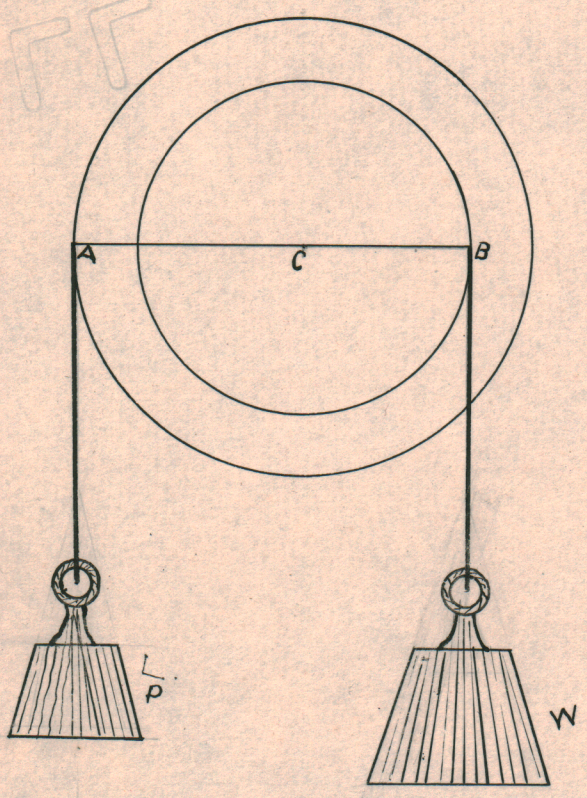
HAMMERMIL
BOND

The wheel and axle.

The wheel and axle consists of a cylinder and a wheel of larger diameter usually turning together on the same axis. In the drawing the axle passes through C. The radius of the cylinder is BC and that of the wheel is AC. The weights P and W are suspended by ropes wrapped around the circumference of the two wheels; their moments about the axis O are P X AC and W X BC respectively.

HAMMERMILL

# WHEEL AND AXLE




## EXPERIMENT NO. 30

LABORATORY

PHYSICS

JAN. 23, 1917.

H. L. BRANSON.

HAMMERMILL BOND

# EXPERIMENT NO. 31.

## LABORATORY

**OBJECT** To illustrate fixed and movable pulleys

**APPARATUS** Two pulleys, cords and two weights.

**PROCEDURE**

A I fastened one pulley to the bar and attached the weight as illustrated

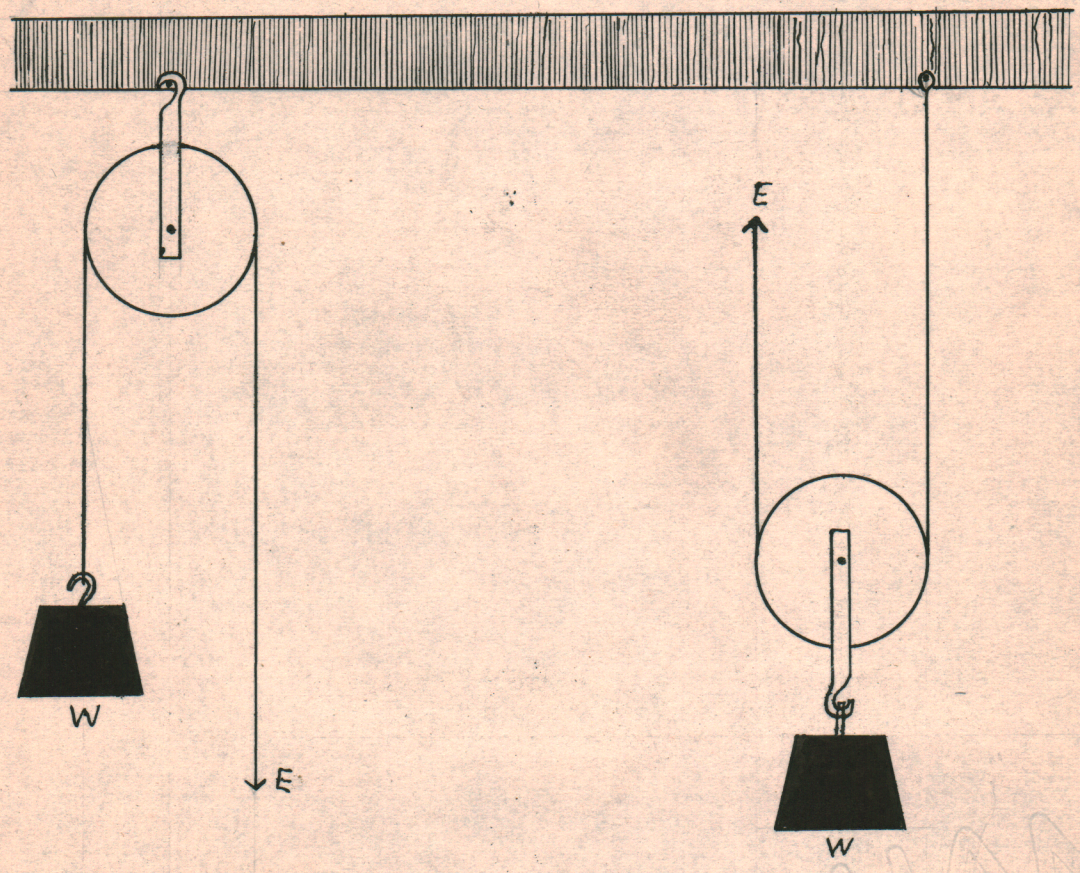
B I fastened one end of string to bar and pulley and weight as illustrated.

**OBSERVATION** I observed that a force equal to the weight of the weight was required to hold the weight in position.

**CONCLUSION** I concluded that for the single pulley the force had to be equal to the weight lifted.

HAMMERMILL BOND

# FIXED AND MOVABLE PULLEYS




## EXPERIMENT NO. 31
## LABORATORY
## PHYSICS

JAN. 24, 1917

H.L. BRANSON.

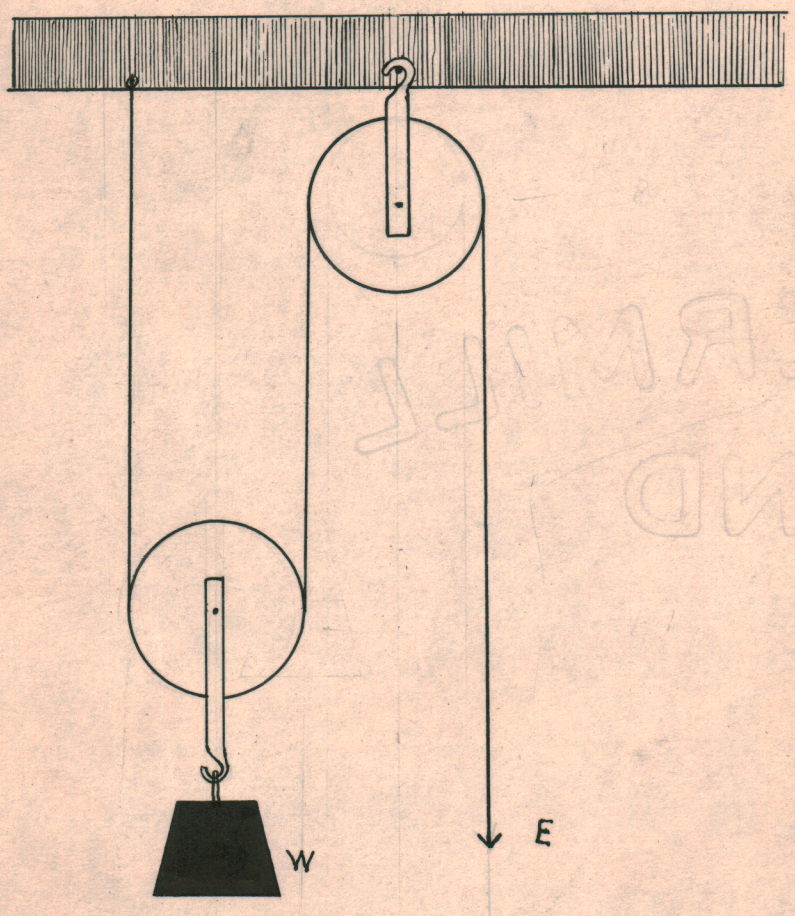
# EXPERIMENT · NO·32·

## EXPLANATION

### System of fixed and Movable Pulleys 8

Fixed and moveable pulleys are combined in a great variety of ways. One of the most common is the one illustrated on a continuous cord. It has one fixed and one movable pulley.

# SYSTEM OF FIXED AND MOVABLE PULLEYS




## EXPERIMENT NO. 32

LABORATORY

PHYSICS

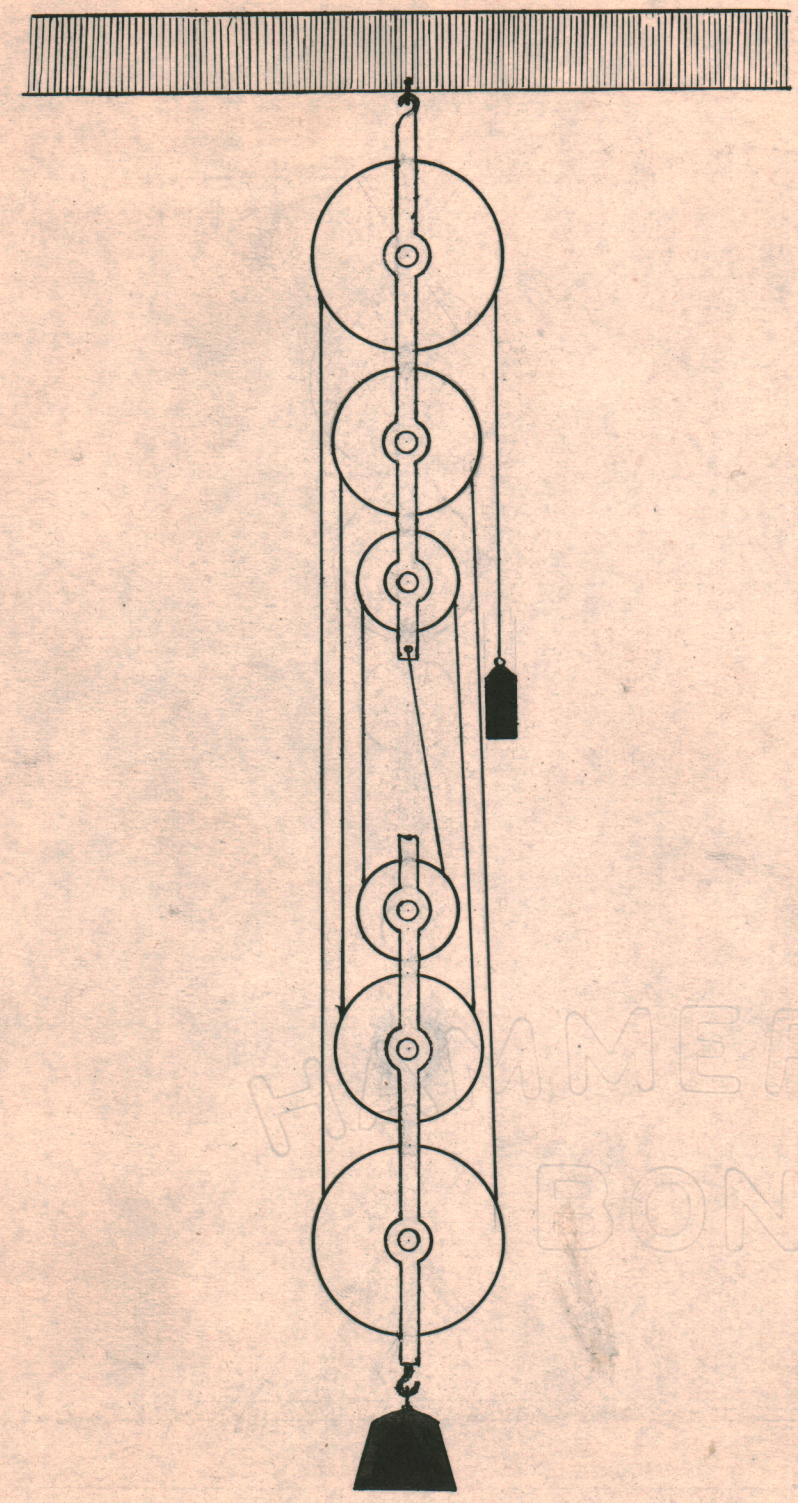
JAN. 24. 1917

H.L. BRANSON.

# EXPERIMENT NO. 33.
## LABORATORY

| | |
|---|---|
| OBJECT | To illustrate the mechanical advantage of the pulley. |
| APPARATUS | Three pulleys, cord, and two weights. |
| PROCEDURE | I suspended the pulleys and cord as illustrated and placed weights to moveable pulley and cord. |
| OBSERVATION | I observed that the small weight would balance the large weight and that the smaller weight moved much faster than the larger one. |
| CONCLUSION | I concluded that when a continuous cord is used the mechanical advantage of the pulley is equal to the number of times the cord passes to and from the movable block. |

# MECHANICAL ADVANTAGE OF THE PULLEY



## EXPERIMENT NO. 33

LABORATORY

PHYSICS

JAN. 24. 1917

H.L. BRANSON.

# EXPERIMENT NO. 34.

## EXPLANATION

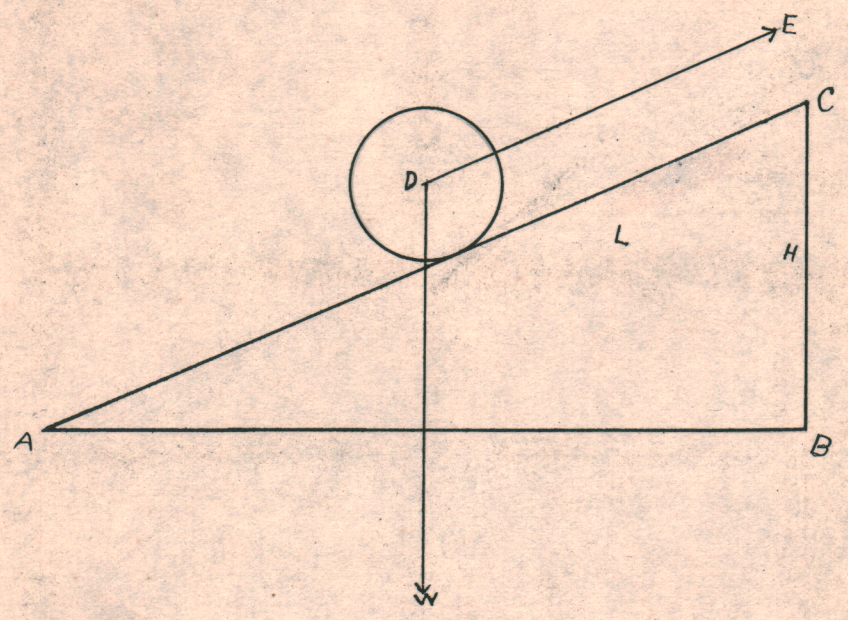
### Case I Mechanical advantage of the incline plane.

The most convenient way to find the relation between the force E and the weight W of the body D is to apply the principal of work. Suppose D to be moved by the force E from A to C. Then the work done by E is E X AC. Since the body D is lifted through a vertical distance BC, the work done on it against gravity is W X BC. Therefore, E X AC = W X BC and

$$\frac{W}{E} = \frac{AC}{BC} = \frac{l}{h}$$

# MECHANICAL ADVANTAGE OF THE INCLINE PLANE

CASE I




## EXPERIMENT NO. 34.

LABORATORY

PHYSICS

JAN. 25, 1917

H. L. BRANSON.

# EXPERIMENT · NO·35·

## EXPLANATION

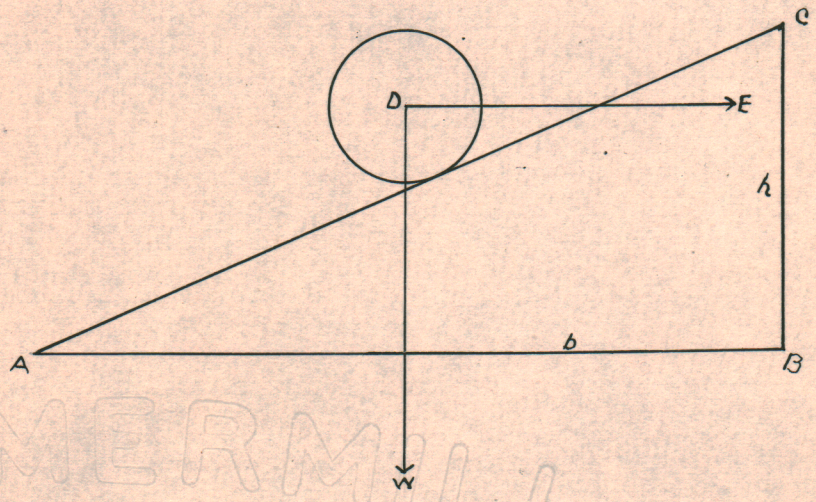
Case II: Mechanical advantage of the incline plane

In expressing the work done by the force E in moving the body up the plane from A to C, we take the displacement measured in the direction in which the force acts. This displacement in this case is not AC, but AB, the base of the plane. Then the general equation becomes $E \times AB = W \times BC$, and

$$\frac{W}{E} = \frac{AB}{BC} = \frac{b}{h}.$$

# MECHANICAL ADVANTAGE OF THE INCLINE PLANE

CASE II




HAMMERMILL BOND

## EXPERIMENT NO. 35

LABORATORY

PHYSICS

JAN. 24, 1917

H.L. BRANSON

# EXPERIMENT · NO 36 ·

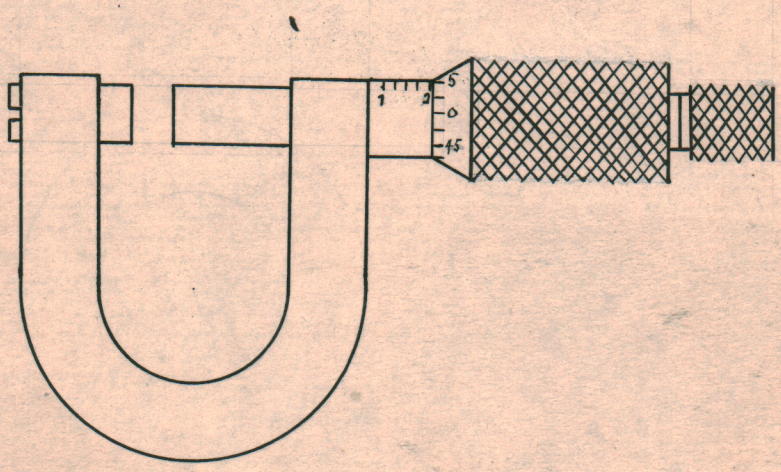
## EXPLANATION

HAMMERMILL BOND

Micrometer

The micrometer is an important application of the screw for measuring small dimentions. An accurate screw has a head divided into a a number of equal parts to register an part of a revolution. It is used to measure wire, paper or any very thin object.

# MICROMETER




## EXPERIMENT NO. 36
## LABORATORY
## PHYSICS

JAN. 26, 1917

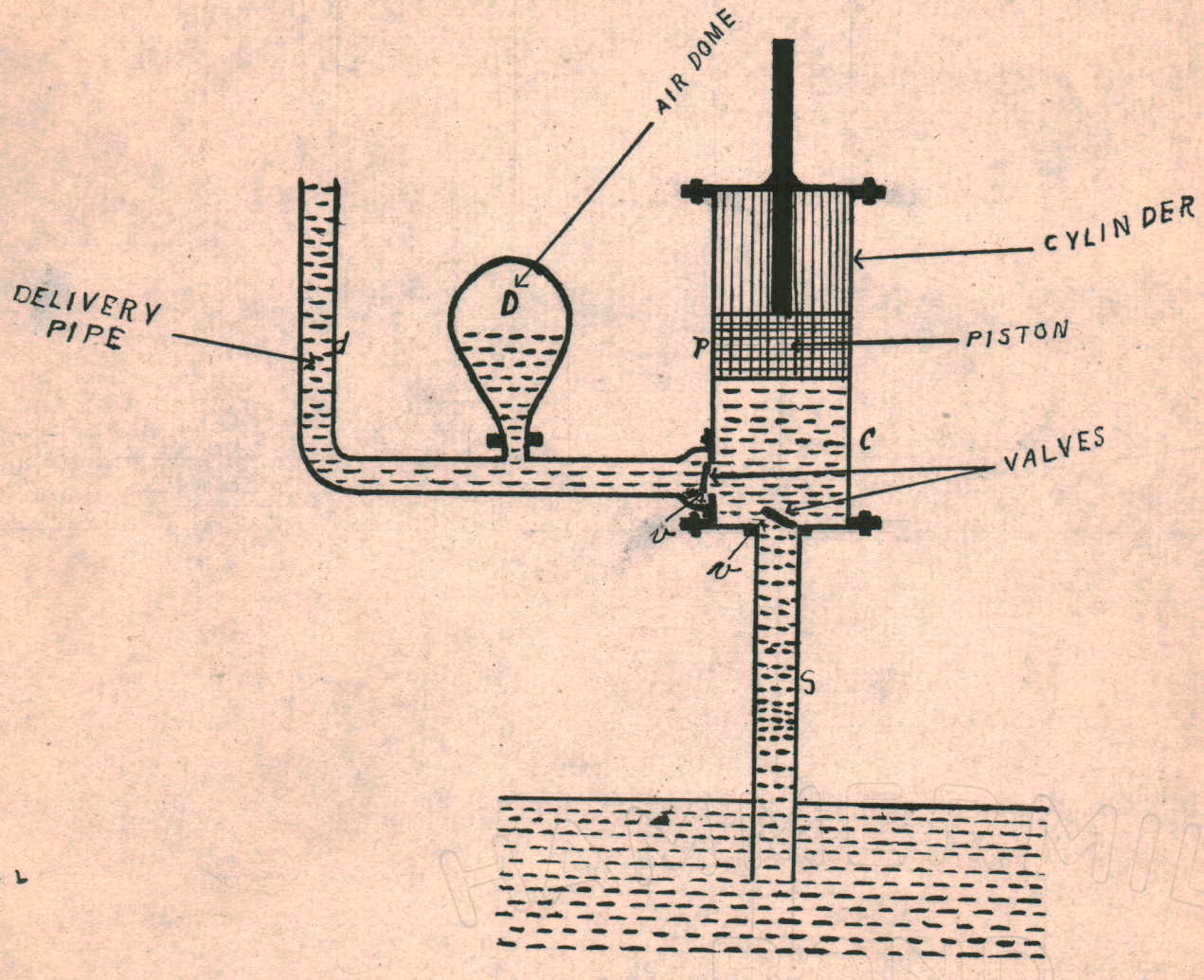
H. L. BRANSON.

# EXPERIMENT NO. 37.

## EXPLANATION

Force pump.

This force pump is used to deliver water under pressure, either at a point higher than the pump into pipes. The air dome D is added to secure a continuous flow through the delivery pipe d. Water flows out through v' only while the piston is descending without the air dome, water would not flow out through the pipe d only during the down stroke of the piston; but the water under pressure from the piston enters the dome and compresses the air. The elastic force of the air drives the water out again as soon as v' closes. Thus the flow is continuous.




# EXPERIMENT NO. 37

## LABORATORY PHYSICS

DEC. 17, 1916

H. L. BRANSON.

ACCEPTED
J. W. A. BROWN

# DEFINITIONS

**PHYSICS** is the science which deals with matter and energy.

**SOLID** When the molecules are close together, the attractive force is strong and there is comparatively little motion among the molecules, the substance is a solid.

**LIQUID** When there is greater freedom of motion among the molecules and the attraction is less, but sufficiently great to hold the molecules together loosely, the body is a liquid.

**GAS** When the motion of the molecules becomes so great that the attractive force is entirely overcome, the molecules appear to repel one another and fly apart, filling every portion of the space allotted to them.

ACCEPTED
J. W. A. BROWN

# DEFINITIONS

## GENERAL PROPERTIES OF MATTER

**EXTENTION** is the property of occupying space or having dimentions.

**IMPENTRABILITY** The general property of matter that no two bodies can occupy the same space at the same time is known as impenetrability.

**INERTIA** is the property which all matter possesses of resisting any attempt to start it, if at rest, to stop it if in motion, or to change either the direction or the amount of its motion.

**MASS** is the measure of the resistance which a body offers to motion or change of motion

**COHESION** is the attractive force that like molecules have for each other.

**ADHESION** is the attractive force that unlike molecules have for each other.

**POROSITY** All matter is probably porous, though the pores are invisible and the corresponding property is called porosity

ACCEPTED
J. W. A. BROWN

# DEFINITIONS

## SPECIFIC PROPERTIES OF MATTER

**TENACITY** is the resistance which a body offers to being torn apart.

**DUCTILITY** is the property of a substance which permits it to be drawn into wires or filaments

**MALLEABILITY** is a property which permits the hammering or rolling of some metals into thin sheets.

**HARDNESS** is the resistance offered by a body to scratching by other bodies.

**BRITTLENESS** is aptness to break under a blow.

## PHYSICAL MEASUREMENTS

**UNIT OF LENGTH** The length of a body is the number of times this unit is contained in the longest dimentions of the body.

**UNIT OF MASS** The unit of mass in the metric system is the kilogram.

**UNIT OF TIME** The unit of time in universal use is physics is the second

## MOLECULAR MOTION

**DIFFUSION** The process of the spontaneous mixing of gases is call diffusion.

ACCEPTED
J. W. A. BROWN

EFFUSION The passage of a gas through the pores of a solid is known as effusion.

HAMMERMILL BOND

ACCEPTED
J. W. A. BROWN

# Petroleum.

Petroleum is a natural rock oil composed of hydrocarbons. It is classed with natural gas. Other names for petroleum are mineral oil, rock oil, and naphtha.

Petroleum has long been known in various parts of the world world by its appearance in the form of bituminous springs or as a floating scum on the surface of pools. It was used at a very early period in Rome for lamps. In the early part of the nineteenth century oil was discovered on the western slopes of the Alleghanies by the digging of a brine well. The Pennsylvania Rock-Oil

Company was organized in 1854 but without success. Five years later, Col. E. L. Drake put down a productive well. From that time it has been a leading industry.

Petroleum is a liquid that varies in color, being black, brown, red, amber, or straw.

The oldest and most noted field in the United States is the Apalachian which extends through southwestern New York to Tennessee.

Petroleum is mined by drilling well like that used for gas. After the well is drilled a torpedo is exploded in the bottom.

This starts the flow of oil sometimes with tremendous velocity. At first the oil was transported on carts, later it was carried in barges or by railway in tank cars, but these methods gave place to the system of pipe lines. The pipes are from 4 to 6 inches in diameter and usually laid under the ground. Pumping stations are placed every 25 or 30 miles. The paraffin wax sticks to the sides of the pipes and clog them. An instrument has been invented called a go-devil to clean the pipes with.

The crude oil is refined by distilling it and running the vapor

through cold water.

Petroleum is used to a large degree for fuel and lights.

HAMMERMILL BOND